

MEDICINE

Revised Ordinance Governing

# MBBS DEGREE COURSE & CURRICULUM PHASE I AND II SUBJECTS - 2004



RAJIV GANDHI UNIVERSITY OF  
HEALTH SCIENCES, KARNATAKA



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## Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore

### The Emblem



The Emblem of the Rajiv Gandhi University of Health Sciences is a symbolic expression of the confluence of both Eastern and Western Health Sciences. A central wand with entwined snakes symbolises Greek and Roman Gods of Health called Hermis and Mercury is adapted as symbol of modern medical science. The pot above depicts Amrutha Kalasham of Dhanvanthri the father of all Health Sciences. The wings above it depicts Human Soul called Hamsa (Swan) in Indian philosophy. The rising Sun at the top symbolises knowledge and enlightenment. The two twigs of leaves in western philosophy symbolises Olive branches, which is an expression of Peace. Philosophy it depicts Oushadi held in the source of all Medicinal human energy (Yadayahu" inside Shanthi Man Shrunuyana dev... span of our lives always is the motto of the Sciences.

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RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES

Revised Ordinance Governing  
**MBBS DEGREE COURSE AND CURRICULUM**  
of Phase I & II Subjects - 2004



**RAJIV GANDHI UNIVERSITY OF  
HEALTH SCIENCES KARNATAKA**

4th 'T' Block, Jayanagar, Bangalore 560041

Revised Ordinance Governing  
**MBBS Degree Course an Curriculum**  
of Phase I & II Subjects 2004

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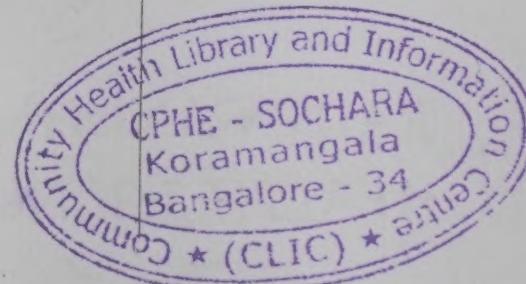
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# Rajiv Gandhi University of Health Sciences, Karnataka

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Ref.: ACA/BOS-27/97-98

Date : 25-09-2004

## NOTIFICATION

Sub: Revised Ordinance governing MBBS Degree Course - 2004

- Ref: 1) Medical council of India Regulations on Graduate Medical Education, 1997  
2) ACA/BOS-27/97-98, dtd 24/03/1998, Revised Ordinance governing MBBS course, Phase I, effective from 1997-98.  
3) ACA/BOS-27/97-98, dtd 24/03/1999, Revised Ordinance governing MBBS course, Phase II, effective from 1998-99.  
4) Amendment of the regulations on graduate medical education notified by Government of India from time to time.  
I. Gazette Notification dated : 29-05-1999.  
ii. Notification No. MCI-37(2)2001/Med-922, dated 12-04-2001.  
iii. Notification No. MCI-26(3)2003/Med-18503, dated 26-09-2003.  
iv. Notification No. MCI-26(3)/2003/Med-20958, dated 15-10-2003.  
5) Proceedings of the Syndicate meeting held on 22-06-2004.  
6) Proceedings of the Syndicate meeting held on 7th, 25th & 30th August 2004

In exercise of the powers conferred under section 35(1) of RGUHS Act 1994, the Syndicate in its meeting held on 7th, 25th and 30th August 2004 has been pleased to approve the Revised Ordinance pertaining to MBBS course as given in schedule here to Annexed.

The Revised Ordinance as above shall be effective for the students admitted to MBBS course from the academic session 2004-05 onwards.

By Order,

Sd/  
**REGISTRAR**

To

The Principals of all Medical Colleges /Institutions, affiliated to Rajiv Gandhi University Health Sciences, Karnataka, Bangalore.

Copy to :

1. The Principal Secretary to Governor, Raj Bhavan, Bangalore - 560001
2. The Principal Secretary to Governor, Medical Education, Health & Family Welfare Dept. III Stage, M.S. Building, Dr. B. R. Ambedkar Veedhi, B'llore-01.
3. PA to Vice-Chancellor/PA to Registrar / Registrar (Eva.)/ Finance Officer, Rajiv Gandhi University Health Sciences, Bangalore.
4. Consultant, Curriculum Development, / Consultant, Computer Centre, Rajiv Gandhi University Health Sciences, Bangalore.
5. All Officers of the University Examination Branch / Academic Section.
6. Guard File / Officer copy.



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4<sup>th</sup> 'T' Block, Jayanagar, Bangalore 560 041

No. AUTH/83 SYN/Amend-MBBS-429/2009-10

10/08/2

### **CORRIGENDUM**

Sub: Amendment to Ordinance Governing MBBS Degree course 2004 pertaining to pass criteria.

Ref: RGUHS Notification No. AUTH/83 SYN/Amend-MBBS-429/2009-10,  
Dated 31/07/2009

\* \* \*

In continuation of the Notification dated 31/07/2009 pertaining to amendment to Ordinance Governing MBBS Degree course (Pass criteria) the following corrigendum is notified.

### **INTERNAL ASSESSMENT**

<b>SL NO</b>	<b>Amended</b>	<b>To be read as</b>
1)	<p>For declaration of pass in any subject in the University examination, a candidate shall pass both in Theory and Practical/Clinical examinations components separately as stipulated below</p> <p><b>The Theory component consists of marks obtained in University Written paper(s) &amp; Viva-Voce examination only.</b></p> <p>For a pass in theory, a candidate shall secure not less than 50% marks in aggregate i.e., marks obtained in University conducted written examination and viva-voce examination added together (<b>excluding internal assessment marks</b>).</p> <p>For a pass in practical/clinical examination, a candidate shall secure not less than 50% marks i.e., marks obtained in university practical/clinical examination (<b>excluding internal assessment marks</b>).</p>	<p>For declaration of pass in any subject in the University examination, a candidate shall pass both in Theory and Practical/Clinical examinations components separately as stipulated below:</p> <p><b>The Theory component consists of marks obtained in University Written paper(s) &amp; Viva-Voce examination only.</b></p> <p>For a pass in theory, a candidate shall secure not less than 50% marks in aggregate i.e., marks obtained in University conducted written examination and viva-voce examination added together (<b>excluding internal assessment marks</b>).</p> <p>For a pass in practical/clinical examination, a candidate shall secure not less than 50% marks i.e., marks obtained in university practical/clinical examination (<b>excluding internal assessment marks</b>).</p> <p><u>For a pass in a subject, a candidate shall secure 50% marks in aggregate (total of externals and internals).</u></p>

Consequently, a student has to secure marks as follows to pass in a subject:

- i) 35% in internal assessment (for eligibility to appear for University examination)
- ii) 50% of the total marks for Theory with Orals (only externals)
- iii) 50% of the marks for Practicals/Clinicals (only externals)
- iv) 50% of the aggregate (total of externals and internals)

The above corrigendum for amendment to Ordinance shall be applicable for MBBS examinations for the students admitted from the academic year 2009-10 and onwards.

By Order,

**REGISTRAR**

**To**

The Principals of all Medical Colleges affiliated to RGUHS with a request to notify this on the notice Board prominently and bring to the notice of all students taking admission to MBBS Course.

**Copy to:**

1. The Secretary to Governor, Governor's Secretariat, Raj Bhavan, Bangalore 560 001.
2. Secretary to Government, Health & Family Welfare Department, (Medical Education), Vikasa Soudha, Bangalore 560 001.
3. The Director, Department of Medical Education, Anand Rao Circle, Bangalore 560 009.
4. PA to Vice-Chancellor / Registrar / Registrar (Eva.) / Finance Officer.
5. Director, Curriculum Development Cell.
6. Public Information Officer.
7. The Home Page of RGUHS Website <http://www.rguhs.ac.in/Authoritysection/Fellowship.html>.
8. Guard File / Office Copy



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4ನೇ ಷಿ ಬ್ಲೌಕ್, ಜಯನಗರ್, ಬೆಂಗಳೂರು - 560 041

**RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA**

4<sup>th</sup> T Block, Jayanagar, Bangalore 560 041

No. AUTH/88 SYN/MBBS/pas criteria/429/2010-11

21/04/2010

## **NOTIFICATION**

**Sub: Amendment to Ordinance Governing MBBS Degree course  
2004 pertaining to pass criteria and marks distribution.**

- Ref: 1] RGUHS Notification No. ACA/BOS-27/97-98 dated 25/09/2004.  
2] RGUHS Notification No. AUTH/83 SYN/Amend-MBBS-429/2009-10,  
dated 31/07/2009 and 10/08/2009.  
3] Minutes of the meeting of the 88<sup>th</sup> Syndicate meeting held on  
21/04/2010.

In continuation of the notification dated 31/07/2009, 10/08/2009 pertaining to amendment to Ordinance governing MBBS Degree Course 2004, the following amendment pertaining to pass criteria and marks distribution is notified by the Syndicate in exercise of the powers conferred under Section 35 of RGUHS Act, 1994 in its 88<sup>th</sup> meeting held on 21/04/2010.

For declaration of pass in any subject in the University examination, a candidate shall pass both in Theory and Practical/Clinical examinations components separately as stipulated below:

**The Theory component consists of marks obtained in University Written paper(s) & Viva-Voce examination only.**

For a pass in theory, a candidate shall secure not less than 50% marks in aggregate i.e., marks obtained in University conducted written examination and viva-voce examination added together (**excluding internal assessment marks**).

For a pass in practical/clinical examination, a candidate shall secure not less than 50% marks i.e., marks obtained in university practical/clinical examination (excluding internal assessment marks).

**For a pass in a subject, a candidate shall secure 50% marks in aggregate (total of externals and internals).**

## **Scheme of Marks Allotment for PHASE I MBBS**

SUBJECTS	Component	Medical Council of India	Rajiv Gandhi University of Health Sciences, Karnataka	
			Existing	Amended
Anatomy	Theory	100	200 (100+100)	200 (100+100)
	Viva (Oral)	20	40	40
	Practical	40	80	80
	IA	Theory	20	60
		Practical	20	40

Physiology	Theory	100	200 (100+100)	200 (100+100)
	Viva (Oral)	20	40	40
	Practical	40	80	80
	IA	Theory	20	60
		Practical	20	40

Biochemistry	Theory	100	100 (50+50)	100 (50+50)
	Viva (Oral)	20	20	20
	Practical	40	40	40
	IA	Theory	20	20
		Practical	20	20

1. The candidate shall secure 35% of the marks in Internal Assessment to be eligible for appearing University conducted theory and practical examination.
2. The candidate shall secure 50% in aggregate with a minimum of 50% in University conducted theory examinations including orals and minimum of 50% in University conducted practicals for declaring to have passed the examination.
3. For over all pass the candidate shall obtain 50% of the marks in theory (University conducted Theory examination and Theory Internal Assessment added together) and 50% of the marks in practicals (University conducted Practical examination and Practical Internal Assessment added together).

The above notification for amendment to Ordinance shall be applicable for MBBS examinations for the students admitted from the academic year 2010-11 and onwards and is not applicable for the students admitted prior to the academic year 2010-11.

By Order,  
**Sd/-**  
**REGISTRAR**

**To**

The Principals of all Medical Colleges affiliated to RGUHS with a request to notify this on the notice Board prominently and bring to the notice of all students taking admission to MBBS Course.

**Copy to:**

1. The Secretary to Governor, Governor's Secretariat, Raj Bhavan, Bangalore 560 001.
2. Secretary to Government, Health & Family Welfare Department, (Medical Education), Vikasa Soudha, Bangalore 560 001.
3. The Director, Department of Medical Education, Anand Rao Circle, Bangalore09.
4. PA to Vice-Chancellor / Registrar / Registrar (Eva.) / Finance Officer.
5. Director, Curriculum Development Cell.
6. Public Information Officer.
7. The Home Page of RGUHS Website <http://www.rguhs.ac.in/Authoritysection/Fellowship.html>.
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# SECTION I

## INTRODUCTION

The Medical Council of India (MCI) revised the M.B.B.S. curriculum. It came into effect from May 1997. Rajiv Gandhi University of Health Sciences will implement the new regulations for the batches of students admitted to the M.B.B.S. course in the academic year 1997-98 onwards.

### **The new regulations recommend:**

1. That the medical curriculum should be oriented towards educating students to take up the responsibilities of physicians of first contact. The medical graduate should be capable of functioning independently in both urban and rural environment.
2. Every effort should be made to provide educational experience that allow hands-on-experience both in hospital as well as in community setting. For this purpose, a comprehensive list of clinical skills that a graduate must acquire at the end of the course including internship has been prepared.
3. That maximum efforts be made to encourage integrated teaching and every attempt be made to de-emphasise compartmentalisation of disciplines so as to achieve horizontal and vertical integration in different phases.
4. That educational experience should emphasise health rather than only disease, and community orientation also instead of only hospital orientation. Population control and family planning should also be given due emphasis.
5. Due importance to be given to teaching common problems of health and disease and to the national programmes.
6. That every effort should be made to use learner oriented methods which would encourage cultivation of logical thinking, clarity of expression, independence of judgment, scientific habits, problem solving abilities, and self-directed learning.
7. Reduction of "didactic lectures (not more than 1/3 of total teaching hours) and increasing use of active methods of learning such as group discussion seminars, role play, field visits, demonstrations, peer interactions etc. which would enable students to develop personality, communication skills and other qualities which are necessary.

8. Examinations be designed with a view to assess not merely the knowledge but also practical and clinical skills, habits and values which are necessary for a graduate to carry out professional day to day work competently.
9. Regular periodic assessment be done throughout the course for internal assessment. The assessment need not be limited to written tests. It should relate to other items such as maintenance of records, participation in seminars and group discussions, clinical case study, proficiency in carrying out practical or clinical skill or participation in projects and assignments (even) during vacation. These be evaluated objectively and recorded.
10. That every medical institution should evolve institutional objectives, which would be in consonance with the national goals (See Section II) and health policy. The institutional objectives should describe the attributes of their product.
11. Shift in the role of medical teachers from mere imparting knowledge to that of a facilitator and motivator of student learning.
12. That every medical college establishes a medical education unit for faculty development, preparation of learning resource materials and improved evaluation methods.

Rajiv Gandhi University of Health Sciences endorses these recommendations. It strongly desires that affiliated colleges should implement these while conducting the MBBS course.

Doctors and other health professionals are confronted with many ethical issues and problems. With advances in science and technology, these problems are on the increase. It is necessary for every doctor to be aware of these problems. The doctors should also be trained to analyze the ethical problems as they arise and deal with them in an acceptable manner. It is therefore recommended that teaching of medical ethics be introduced in phase I and continued throughout the course including the internship period.

In order to implement the new regulations, from the academic year of 1997-98 it was necessary for this University to restructure the I MBBS course. The goals and general objectives of MBBS education are given in Section II. The eligibility for admission, duration of the course, attendance, internal assessment, distribution of marks for Phase-I and II professional examination subjects, criteria for pass, and grounds for migration are given in Section III. Revised course contents of subjects of (syllabi) Phase I and II, teaching schedule and scheme of examination are given in Section IV. The section V contains the topics recommended for teaching of medical ethics. In this edition the amendments made by the Medical council of India from time to time since 1997 have been incorporated.

# SECTION II

## OBJECTIVES OF EDUCATION STATED IN MCI REGULATIONS, 1997

The MCI has stated the goals and general objectives of graduate medical education in the new regulations. They are given in this section. It is desired that in consonance with these national goals, each medical college should evolve institutional objectives.

### 1. NATIONAL GOALS:

At the end of undergraduate programme, the medical student shall endeavour to be able to:

- a. Recognise 'health for all' as a national goal and health right of all citizens and by undergoing training for medical profession fulfill his/her social obligations towards realisation of this goal;
- b. Learn every aspect of National policies on health and devote himself/herself to its practical implementation;
- c. Achieve competence in practice of holistic medicine, encompassing primitive, preventive, curative and rehabilitative aspects of common diseases;
- d. Develop scientific temper, acquire educational experience for proficiency in profession and promote health living;
- e. Become exemplary citizen by observation of medical ethics and fulfilling social and professional obligations, so as to respond to national aspirations.

### 2. INSTITUTIONAL GOALS

The undergraduate students coming out of a medical institution should :

- a. Be competent in diagnosis and management of common health problems of individual and the community, commensurate with his/her position as a member of the health team at the primary, secondary or tertiary levels, using his/her clinical skills based on history, physical examination and relevant investigations;
- b. Be competent to practice preventive, promotive, curative and rehabilitative medicine in respect to the commonly encountered health problems;

- c. Appreciate for different therapeutic modalities, be familiar with the administration of the "essential drugs" and their common side effects;
- d. Be able to appreciate the social-psychological, cultural, economic and environmental factors affecting health and develop humane attitude towards the discharging one's professional responsibilities;
- e. Possess the attitude for continued self learning and to seek further expertise or to pursue research in any chosen area of medicine;

Be familiar with the basic factors, which are essential for the implementation of the National Health Programs including practical aspects of the following:-

- i. Family Welfare and Maternal and Child Health (MCH),
- ii. Sanitation and water supply,
- iii. Prevention and control of communicable and non-communicable diseases,
- iv) Immunisation,
- (v. Health Education;
- f. Acquire basic management skill in the area of human resources, materials and resource management related to health care delivery;
- g. Be able to identify community health Problems and learn to work to resolve these by designing, instituting corrective steps and evaluating outcome of such measures;
- h. Be able to work as a leading partner in health care teams and acquire proficiency in communication skills.
- i. Be competent to work in a variety of health care settings
- j. Have personal characteristics and attitude required for professional life such as personal integrity, sense of responsibility and dependability and ability to relate to or show concern for other individuals.
- k. All efforts must be made to equip the medical graduate to acquire the detailed in Appendix B of Medical Council of India Regulations on Medical Education, 1997.

### **3. DEPARTMENTAL GOALS & OBJECTIVES**

#### **Human Anatomy**

##### **(i) Goal**

The broad goal of the teaching of undergraduate students in Anatomy aims at providing comprehensive knowledge of the gross and microscopic structure and development of human body to provide a basis for understanding the clinical correlation of organs or structures involved and the anatomical basis for the disease presentations.

##### **(ii) Objectives:**

###### **A. Knowledge:**

At the end of the course the student shall be able to:

- a. comprehend the normal disposition, clinically relevant interrelationships, functional and cross sectional anatomy of the various structures in the body;
- b. identify the microscopic structure and correlate elementary ultra structure of various organs and tissues and correlate the structure with the functions as a prerequisite for understanding the altered state in various disease processes;
- c. comprehend the basic structure and connections of the central nervous system to analyse the integrative and regulative functions of the organs and systems. He/she shall be able to locate the site of gross lesions according to the deficits encountered;
- d. demonstrate knowledge of the basic principles and sequential development of the organs and systems, recognize the critical stages and development and effects of common teratogens, genetic mutations and environmental hazards. He/She shall be able to explain the developmental basis of the major variations and abnormalities.

## **B. Skills**

At the end of the course the student shall be able to:

- a. identify and locate all the structures of the body and mark the topography of the living anatomy;
- b. identify the organs and tissues under the microscope;
- c. understand the principles of karyotyping and identify the gross congenital anomalies;
- d. understand principles of newer imaging techniques and interpretation of Computerised Tomography (CT) Scan, sonogram etc.
- e. understand clinical basis of some common clinical procedures i.e., intramuscular and intravenous injection, lumbar puncture and kidney biopsy etc.

## **C. Integration**

From the integrated teaching of other basic sciences, student shall be able to comprehend the regulation and integration of the functions of the organs and systems in the body and thus interpret the anatomical basis of disease process.

## **Human Physiology including Bio Physics**

### **A. Physiology**

#### **i. Goal**

The broad goal of the teaching of undergraduate students in Physiology aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and disease

## **ii. Objectives**

### **a. Knowledge**

At the end of the course the student will be able to:

1. explain the normal functioning of all the organs systems and their interactions for well coordinated total body function;
2. assess the relative contribution of each organ system to the maintenance of the milieu interior;
3. elucidate the physiological aspects of normal growth and development;
4. describe the physiological response and adaptations to environmental stresses;
5. list physiological principles underlying pathogenesis and treatment of disease

### **b. Skills**

At the end of the course the student shall be able to :

1. conduct experiments designed for study of physiological phenomena;
2. interpret experimental/investigative data;
3. distinguish between normal abnormal data derived as a result of tests, which he/she has performed and observed in the laboratory.

### **c. Integration**

At the end of the integrated teaching the student shall acquire an integrated knowledge of organ structure and function and the regulatory mechanisms.

## **B. Bio Physics**

- i. Physical principles of transport across cell membranes and across capillary wall.
- ii. Biopotentials
- iii. Physical principles governing flow of blood in heart and blood vessels.

## **Biochemistry**

Biochemistry including medical physics and Molecular Biology

### **i Goal**

The broad goal of the teaching of undergraduate students in biochemistry is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge acquired in solving clinical problems.

## **ii. Objectives**

### **a. Knowledge**

At the end of the course, the student shall be able to :

1. describe the molecular and functional organization of a cell and list its subcellular components;
2. delineate structure, function and inter-relationships of biomolecules and consequences of deviation from normal;

3. summarize the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;
4. describe digestion and assimilation of nutrients and consequences of malnutrition;
5. integrate the various aspects of metabolism and their regulatory pathways;
6. explain biochemical basis of inherited disorders with their associated sequelae;
7. describe mechanisms involved in maintenance of body fluid and pH homeostasis;
8. outline the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine;
9. summarize the molecular concept of body defences and their application in medicine;
10. outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;
11. Familiarize with principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of a given data;
12. suggest experiments to support theoretical concepts and clinical diagnosis.

**b Skills**

At the end of the course, the student shall be able to:

1. make use of conventional techniques/instruments to perform biochemical analysis relevant to clinical screening and diagnosis;
2. analyse and interpret investigative data;
3. demonstrate the skills of solving scientific and clinical problems and decision making.

**c. Integration**

The knowledge acquired in biochemistry shall help the students to integrate molecular events with structure and function of the human body in health and disease.

**Pathology**

**i. Goal :**

The broad goal of the teaching of undergraduate student in Pathology is to provide the students with a comprehensive knowledge of the mechanisms and causes of disease, in order to enable him/her to achieve complete understanding of the natural history and clinical manifestations of disease.

**ii. Objectives:**

**a. Knowledge :**

At the end of the course, the student shall be able to :-

1. describe the structure and ultra structure of a sick cell, mechanism of cell degeneration, cell death and repair and be able to correlate structural and functional alterations.
2. Explain the pathophysiological processes which govern the maintenance of homeostasis, mechanisms of their disturbance and the morphological and clinical manifestations associated with it;
3. describe the mechanisms and patterns of tissue response to injury such that he/she can appreciate

- the pathophysiology of disease processes and their clinical manifestations.
4. correlate normal and altered morphology (gross and microscopic) of different organ systems in common diseases to the extent needed for understanding of disease processes and their clinical significance.

**b. Skills :**

At the end of the course, the student shall be able to :-

1. describe the rationale and principles of technical procedures of the diagnostic laboratory tests and interpretation of the results;
2. perform the simple bed-side tests on blood, urine and other biological fluid samples;
3. draw a rational scheme of investigation aimed at diagnosing and managing the cases of common disorders.
4. Understand biochemical/physiological disturbances that occur as a result of disease in collaboration with pre-clinical departments.

**c. Integration**

At the end of training he/she shall be able to integrate the causes of disease and relationship of different etiological factors (social, economic and environmental) that contribute to the natural history of diseases most prevalent in India.

## **Microbiology**

**i. GOAL:**

The broad goal of the teaching of undergraduate students in Microbiology is to provide an understanding of the natural history of infectious diseases in order to deal with the etiology, pathogenesis, laboratory diagnosis, treatment and control of infections in the community.

**II. OBJECTIVES:**

**a. Knowledge**

At the end of the course, the student shall be able to :

1. state the infective micro-organisms of the human body and describe the host-parasite relationship;
2. list pathogenic micro-organisms (bacteria, viruses, parasites, fungi) and describe the pathogenesis of the diseases produced by them;
3. state or indicate the modes of transmission of pathogenic and opportunistic organisms and their sources, including insect vectors responsible for transmission of infection;
4. describe the mechanisms of immunity to infections;
5. acquire knowledge on suitable antimicrobial agents for treatment of infections and scope of immunotherapy and different vaccines available for prevention of communicable diseases;
6. apply methods of disinfection and sterilization to control and prevent hospital and community acquired infections;
7. recommend laboratory investigations regarding bacteriological examination of food, water and air.

**b. SKILLS :**

At the end of the course, the student shall be able to :

1. Plan and interpret laboratory investigations for the diagnosis of infections diseases and to correlate the clinical manifestations with the etiological agent;
2. Identify the common infection agents with the help of laboratory procedures and use antimicrobial sensitivity test to select suitable antimicrobial agents.
3. Perform commonly employed bed-side tests for detection of infections agents such as blood film for malaria, filaria, gram staining and Acid Fast Bacilli (AFB) staining and stool sample for ova cyst etc.

**c. INTEGRATION**

The student shall understand infection diseases of national importance in relation to the clinical, therapeutic and preventive aspects.

**Forensic Medicine & Toxicology****i. Goal :**

The broad goal of the teaching of undergraduate student in Forensic Medicine is to produce a physician who is well informed about medico legal responsibilities in practice of medicine. He / She acquires knowledge of law in relation to medical practice, medical negligence and respect for codes of medical ethics.

**ii. Objectives :****a. Knowledge:**

At the end of the course, the student shall be able to :

1. Identify the basic medico legal aspects of hospital and general practice;
2. Define the medico legal responsibilities of a general physician while rendering community service either in a rural primary health center or an urban health center.

**b. Skills :**

1. Make observations and logical inferences in order to initiate enquiries in criminal; matters and medico legal problems;
2. Diagnose and treat common emergencies in poisoning and manage chronic toxicity.
3. Make observations and interpret funding at postmortem examination;
4. Observe the principles of medical ethics in the practice of his profession.

**c. Integration :**

Department shall provide an integrated approach towards allied disciplines like Pathology, Radiology, Forensic Sciences, hospital Administration etc. to impart training regarding medico legal responsibilities of physicians at all levels of health care. Integration with relevant disciplines will provide scientific basic of clinical toxicology e.g. medicine, pharmacology, etc.

## **Pharmacology**

### **i. Goal :**

The broad goal of the teaching of undergraduate students in Pharmacology is to inculcate a rational and scientific basic of therapeutics.

### **ii) Objectives :**

#### **a. Knowledge :**

At the end of the course, the student be able to :

1. Describe the pharmacokinetics and pharmacodynamics of essential and commonly used drugs;
2. List the indications, contraindications, interactions and adverse reactions of commonly used drugs;
3. Indicate the use of appropriate drug in a particular disease with considerations to the cost, efficacy and safety for
  - i) individual needs;
  - ii) mass therapy under national health programmes
4. Describe the pharmacokinetic basis, clinical presentation, diagnosis and management of common poisonings.
5. List the drugs of addiction and recommend the management;
6. Classify environmental and occupational pollutants and state the management issues;
7. Indicate causations in prescription of drugs in special medical situations such as pregnancy, lactation, infancy and old age.
8. Integrate the concept of rational drug therapy in clinical pharmacology;
9. State the principles underlying the concept of 'Essential Drugs';
10. Evaluate the ethics and modalities involved in the development and introduction of new drugs;

#### **b. Skills :**

At the end of the course, the student shall be able to :

1. Prescribe drugs for common ailments;
2. Recognize adverse reactions and interactions of commonly used drugs;
3. Observe experiments designed for study of effects of drugs, bioassay and interpretations of the experimental data;
4. Scan information on common pharmaceutical preparations and critical by evaluate drug formulations;

#### **c. Integration :**

Practical knowledge of use of drugs in clinical practice will be acquired through integrated teaching with clinical departments and pre-clinical departments.

## **Community Medicine**

### **i. Goal :**

The broad goal of the teaching of undergraduate students in Community Medicine is to prepare

them to function as community and first level physicians in accordance with the institutional goals.

**ii) Objectives :**

**a. Knowledge :**

At the end of the course, the student shall be able to :-

1. describe the health care delivery system including rehabilitation of the disable in the country;
2. describe the National Health Programmes with particular emphasis on maternal and child health programmes, family welfare planning and population control;
3. list epidemiological methods and describe their applications to communicable and non-communicable diseases in the community or hospital situation;
4. apply bio-statistical methods and techniques;
5. outline the demographic pattern of the country and appreciate the roles of the individual family, community and socio-cultural milieu ion health and disease;
6. describe the health information systems;
7. enunciate the principles and components of primary health care and the national health policies to achieve the goal of 'Health administration, Health education in relation to community'.
8. able to plan Health Programme/IFC activities and able to evaluate a programme.
9. able to describe principles of organization.

**b. Skills :**

At the end of the course, the student should be able to :-

1. use epidemiology as a scientific tool to make national decisions relevant to community and individual patient intervention;
2. collect, analyze, interpret and present simple community and hospital based data;
3. diagnose and manage common health problems and emergencies at the individual family and community levels keeping in mind the existing health care resources and in the context of the prevailing socio-cultural beliefs;
4. diagnose and manage maternal and child health problems and advise a couple and the community on the family welfare planning methods available in the context of the national priorities;
5. diagnose and manage common nutritional problems at the individual and community level;
6. plan, implement and evaluate a health education program with skill to use simple audiovisual aids.
7. Interact with other members of the health care team and participate in the organization of health care team and participate in the organization of health care services and implementation of national health programmes.
8. To conduct group meetings/able to give health talk.

**c. Integration :**

Develop capabilities of synthesis between cause of illness in the environment or community and individual health and respond with leadership qualities to institute remedial measures for this.

# SECTION III

## REGULATIONS GOVERNING MBBS DEGREE COURSE

### **Eligibility for Admission, Duration, Attendance and Scheme of Examination**

#### **1. ELIGIBILITY**

##### **1.1 Qualifying Examination**

A candidate seeking admission to first MBBS course:

- i. shall have passed two years Pre University examination conducted by Department of Pre-University Education, Karnataka State, with English as one of the subjects and Physics, Chemistry and Biology as optional subjects. The candidate shall have passed subjects of English, Physics, Chemistry and Biology individually also.

OR

- ii. shall have passed any other examination conducted by Boards/Councils/Intermediate Education established by State Governments/ Central Government and recognised as equivalent to two year Pre University examination by the Rajiv Gandhi University of Health Sciences/Association of Indian Universities (AIU), with English as one of the subjects and Physics, Chemistry and Biology as optional subjects and the candidate shall have passed subjects of English, Physics, Chemistry and Biology individually.

OR

- iii. shall have passed Intermediate examination in Science of an Indian University/Board/Council or other recognised examining bodies with Physics, Chemistry and Biology, which shall include a practical test in these subjects and also English as compulsory subject. The candidate shall have passed subjects of English, Physics, Chemistry and Biology individually.

OR

- iv. shall have passed first year of the three year degree course of a recognised University with Physics, Chemistry and Biology including a practical test in these subjects provided the examination is an 'University Examination' provided that the candidate shall have passed subjects of English, Physics, Chemistry and Biology individually in the pre university or other examinations mentioned in the clauses above.

OR

- v. shall have passed B.Sc. Examination of an Indian University, provided that he/she has passed the B.Sc. examination with not less than two of the following subjects: Physics, Chemistry, Biology (Botany, Zoology) provided the candidate has passed subjects of English, Physics, Chemistry and Biology individually in the qualifying examinations mentioned in clauses (i), (ii) and (iii).

Note: Candidates who have passed "Physical Science" instead of Physics and Chemistry as two separate subjects are not eligible for admission to MBBS course as per Medical Council of India Regulations vide letter MCI-37(2)/2001/Med.922 dated 14.02.2001 and RGUHS letter UA/ELY-115/1998-2000 dated 22.05.2001.

### **1.2 Marks**

The selection of students to medical colleges shall be based on merit provided that :

- a. In case of admission on the basis of qualifying examination, a candidate for admission to MBBS course must have passed individually in the subjects of Physics, Chemistry, Biology and English and must have obtained a minimum of 50% marks taken together in Physics, Chemistry and Biology in the qualifying examination. In respect of candidates belonging to Scheduled Castes, Scheduled Tribes or Other Backward Classes, the marks obtained in Physics, Chemistry and Biology taken together in qualifying examination be 40% instead of 50% as above.
- b. In case of admission on the basis of competitive entrance examination, a candidate must have passed individually in the subjects of Physics, Chemistry, Biology and English and must have obtained a minimum of 50% marks in Physics, Chemistry and Biology taken together at the qualifying examination and in addition must have come in the merit list prepared as a result of such competitive entrance examination by securing not less than 50% marks in Physics, Chemistry and Biology taken together in the competitive examination. In respect of candidates belonging to Scheduled Castes, Scheduled Tribes or Other Backward Classes the marks obtained in Physics, Chemistry and Biology taken together in qualifying examination and competitive entrance examination be 40% instead of 50% as stated above. (vide amendment to MCI Regulations, 1997, notified in Gazette of Government of India dated 29.05.1999).

1.3 Age : The candidate should have completed 17 years on or before 31st day of December of the year of admission.

### **2. DURATION OF THE COURSE**

- i. Every student shall undergo a period of certified study extending over 4½ academic years from the date of commencement of his study for the subject comprising the medical curriculum to the date of completion of the examination followed by one year compulsory rotating Internship. The 4 ½ years course has been divided into three phases.

1. Phase - I - 1 year, consisting of two terms of 6 months each.
  2. Phase - II - 1  $\frac{1}{2}$  years, consisting of three terms of 6 months each
  3. Phase - III - 3  $\frac{1}{2}$  years, after Phase - I, consisting of 7 terms
- ii. The first year shall be occupied in the study of the Phase - I (Pre Clinical) subject of Human Anatomy (650 hours), Physiology including Bio Physics (480 hours), Bio Chemistry (240 hours) and Introduction to Community Medicine (60 hours). A detailed syllabus is given in Section IV A.
- iii. After passing pre-clinical subjects in Phase - I, the Phase - II shall be 3 terms (1  $\frac{1}{2}$  years), devoted to Para Clinical and Clinical subjects. Para Clinical subjects shall consist of Pathology, Pharmacology, Microbiology, Forensic Medicine including Toxicology and part of Community Medicine. During this phase the clinical subjects shall be taught concurrently. The clinical subjects taught will be Medicine and its allied specialities, Surgery and its allied specialities and Obstetrics and Gynecology.
- iv. Phase - III consists of Community Medicine and clinical subjects - Medicine and its allied specialists, Surgery and its allied specialities, Obstetrics and Gynecology.

### **3. ATTENDANCE**

Every candidate should have attendance not less than 75% of the total classes conducted in theory, practical and clinical jointly in each calendar year calculated from the date of commencement of the term to the last working day as notified by the University in each of the subjects prescribed to be eligible to appear for the university examination. (vide Medical Council of India Notification on Graduate Medical Education (Amendment) Regulations 2003, published in the Gazette of India Part III, Section 4, Extraordinary issued on 15th October 2003)

The Principal should notify at the College the attendance details at the end of each term without fail under intimation to this University.

A candidate lacking in the prescribed attendance and progress in any subject(s) in theory or practical/clinical in the first appearance should not be permitted to appear for the examination in that subject(s).

#### 4. TEACHING HOURS

##### Phase I

**Table I : Distribution of teaching hours in Phase I subjects**

Method	Subject / Number of Hours			
	Anatomy	Physiology	Biochemistry	Community Medicine
Lectures	4 hrs per week	160 hrs	120 hrs	40 hrs
Tutorials	1 hr per week		20 hrs	10 hrs
Group Discussion *	1 hrs per week	80 hrs	20 hrs	4 hrs
Practical / Demonstration **	2 hrs per week	240 hrs	80 hrs	6 hrs
Dissection	8 hrs per week	--	--	--
<b>Total</b>	<b>650</b>	<b>480</b>	<b>240</b>	<b>60</b>

\*Includes Seminars, Integrated Teaching, \*\* Includes field visits

##### Phase II

**Table II : Teaching hours for theory and practical classes for the Phase - II subjects**

Subject	Theory	Practicals	Integrated teaching	Total hours
Pathology	120 hrs.	144 hrs.	36 hrs.	300
Pharmacology	120 hrs.	144 hrs.	36 hrs.	300
Microbiology	120 hrs.	94 hrs.	36 hrs.	250
Forensic Medicine	70 hrs.	20 hrs.	10 hrs.	100
Community Medicine *	100 hrs.	80 hrs.	20 hrs.	200

\* Community Medicine teaching will continue in Phase III, Part I also

#### SCHEME OF EXAMINATION

#### 5. INTERNAL ASSESSMENT

It shall be based on evaluation of assignment, preparation of seminar, clinical presentation etc., (see Annex-1 for examples). Regular periodic examinations should be conducted throughout the course. Although the question of number of examinations is left to the institution, there should be a minimum of at least three (3) sessional examinations during Phase -1 of the course and average of best two examination marks should be taken into consideration while calculating the marks for the internal assessment. Day to day records should be given importance in the internal assessment. The weightage given to internal assessment is 20% out of total marks assigned for a subject.

A Student must secure at least 35% of total marks fixed for internal assessment in a particular subject in order to be eligible to appear in the University Examination of that subject. (vide Medical Council of India Notification on Graduate Medical Education (Amendment) Regulations 2003,

published in the Gazette of India Part III, Section 4, Extraordinary issued on 15th October 2003).

Assistant Professor and above or lecturer with five years of teaching experience can conduct Internal Assessment Examination. Proper record of the work should be maintained which will be the basis of all students' internal assessment and should be available for scrutiny. The internal assessment marks of both theory and practical obtained by the candidates should be sent to the University at least fifteen days prior to the commencement of theory examination

## **Phase I**

### **Internal Assessment for Anatomy & Physiology**

Total Marks : 80 (Theory - 60 and Practical - 20)

#### **Theory :**

Minimum of three examinations are recommended. The sessional examination preceding the University examination may be similar to the pattern of University examination. Average of any two best marks obtained in the notified internal examinations may be taken into consideration for calculating internal assessment. The total marks be reduced to 60 and sent to the University.

#### **Practicals:**

There will be two terminal practical examinations. Five marks will be for records and 15 marks for terminal examinations. Average marks of the two terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and sum of the two shall be sent to the University.

The internal assessment marks both theory and practical obtained by the candidates should be sent to the University at least fifteen days prior to the commencement of theory examination.

### **Internal Assessment for Biochemistry**

Total Marks : 40 (Theory : 20 + 10 for records and Practical : 10)

#### **Theory and Records:**

Minimum of three examinations are recommended. The examination preceding the University examination will be similar to the University examination. The total marks would be 20. Average marks secured out of best of two notified internal examinations should be reduced to 20. For records 10 marks are allotted. The sum of the marks obtained in theory and records shall be sent to the University.

## **Practicals :**

A minimum of two practical tests is to be conducted, one at the end of each term. Average of the two tests should be reduced to 10 marks and shall be sent to the University

## **Phase II**

**Internal Assessment in Pathology, Pharmacology, Microbiology and Community Medicine**  
Total marks : 80 (Theory - 60 and Practical - 20)

## **Theory**

Minimum of three examinations are recommended. The examination preceding the University examination will be similar to the University examination. The total marks would be 30. Average marks of best of two notified internal examinations should be reduced to 30 and should be sent to the University.

## **Practicals**

A minimum of three practical tests is to be conducted, one at the end of each term. Five marks will be for records and 15 marks for terminal examinations. Average marks of the three terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and sum of the two shall be sent to the University.

## **Internal Assessment in Forensic Medicine**

Total marks : 40 (Theory - 30 and Practical - 10)

## **Theory**

Minimum of three examinations are recommended. The examination preceding the University examination will be similar to the University examination. The total marks would be 30. Average marks of best of two notified internal examinations should be reduced to 30 and should be sent to the University.

## **Practical**

Internal Assessment examination for Practicals and allotment of marks for records will be as follows : The total of 10 marks will be first increased notionally to 50. Out of the 50 marks, 40 will be allotted to terminal practical tests and 10 marks for records. Four practical tests shall be conducted each carrying 10 marks. The marks obtained in the four practical tests and records would be reduced to 10 and sent to the University.

## 6. University Examination - Subjects and Distribution of Marks

### Phase I

**Table III: Examination components, Subjects and Distribution of Marks**

A. THEORY	ANATOMY	PHYSIOLOGY	BIOCHEMISTRY
1. Written Paper			
No. of Papers & Maximum Marks for each paper.	Two $2 \times 100 = 200$	Two $2 \times 100 = 200$	Two $2 \times 50 = 100$
2. Viva-Voce	40	40	20
3. Internal Assessment (Theory)	60	60	30
Total Theory	300	300	150
<b>B. PRACTICAL</b>			
1. Practicals	80	80	40
2. Internal Assessment (Practical)	20	20	10
Total Practicals	100	100	50
<b>GRAND TOTAL</b>	400	400	200

### Phase II

**Table IV: Examination components, Subjects and Distribution of Marks**

	Pathology	Microbiology	Pharmacology	Forensic Medicine	Community Medicine *
<b>a. THEORY</b>					
1. Written Paper : No of papers & maximum marks for each paper	Two $2 \times 100 = 200$	Two $2 \times 100 = 200$	Two $2 \times 100 = 200$	One 100	Two $2 \times 100 = 200$
2. Viva-Voce	40	40	40	20	40
3. Internal assessment (Theory)	60	60	60	30	60
Total Theory	300	300	300	150	300
<b>b. PRACTICAL</b>					
1. Practical	80	80	80	40	80
2. Internal assessment (Practical)	20 (Practicals 15 + Record 5)	20 (Practicals 15 + Record 5)	20 (Practicals 15 + Record 5)	10 (Practicals - 5 + Record - 5)	20 (Practicals 15 + Record 5)
Total Practicals	100	100	100	50	100
Grand Total	400	400	400	200	400

\*Note : The examination for Community Medicine will be held in Phase III along with Part-I subjects.

**Table - V : Type, number of questions and distribution of marks for written paper.**

Type of Questions	Number of questions	Marks for each question
Essay type questions	2	10
Short Essay types questions	10	5
Short answer questions	10	3

## **7. SUBMISSION OF LABORATORY RECORD NOTE BOOK**

- a. At the time of Practical/Clinical Examination each candidate shall submit to the Examiners his/her laboratory notebook duly certified by the Head of the Department as a bonafide record of the work done by the candidate.
- b. The candidate may be permitted by the examiners to refer the practical record book during the Practical Examination in the subject of Biochemistry only. No other material, handwritten, cyclostyled or printed guides are allowed for reference during the practical examination.

## **8. ELIGIBILITY FOR EXAMINATION :**

- To be eligible to appear for University examination a candidate :-
- a. shall have undergone satisfactorily the approved course of study in the subject/subjects for the prescribed duration.
  - b. shall have attended at least 75% of the total number of classes in theory and practical/clinical, jointly to become eligible to appear for examination in that subject/subjects.
  - c. shall secure at least 35% of total marks fixed for internal assessment in a particular subject in order to be eligible to appear in the University Examination of that subject. (MCI Graduate Medical Education (Amendment) Regulations, 2003).
  - d. shall fulfill any other requirement that may be prescribed by the University from time to time.
  - e. who fails in any subject/subjects of MBBS Phase -1, has to put one academic term before he/she becomes eligible to appear for the next examination.
  - f. shall pass in all the Phase I (Pre-Clinical) subjects, before joining the Phase II (Para-Clinical) subjects.
  - g. who fails in the II professional examination shall not be allowed to appear in Part I of Third professional examination unless he/she passes all subjects of II Professional examination.

## **9. CRITERIA FOR PASS**

For declaration of pass in any subject in the University examination, a candidate shall pass both in Theory and Practical/Clinical examinations components separately as stipulated below:

The Theory component consists of marks obtained in University Written paper(s), Viva-Voce examination and internal Assessment (Theory). For a pass in theory, a candidate shall secure not less than 50% marks in aggregate i.e., marks obtained in written examination, viva-voce examination and internal assessment (theory) added together. For a pass in practical/clinical examination, a candidate shall secure not less than 50% marks in aggregate, i.e., marks obtained in university practical/clinical examination and internal assessment (practical) added together.

A candidate not securing 50% marks in aggregate in Theory or Practical/Clinical examination in a subject shall be declared to have failed in that subject and is required to appear for both Theory and Practical/Clinical again in the subsequent examination in that subject.

## **10. DECLARATION OF CLASS :**

- a. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 75% of marks or more of grand total marks prescribed will be declared to have passed the examination with distinction.
- b. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 65% of marks or more but less than 75% of grand total marks prescribed will be declared to have passed the examination in First Class.
- c. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 50% of marks or more but less than 65% of grand total marks prescribed will be declared to have passed the examination in Second Class.
- d. A candidate passing a university examination in more than one attempt shall be placed in Pass class irrespective of the percentage of marks secured by him/her in the examination.

[Please note fraction of marks should not be rounded off for clauses (a), (b) and ©]

## **11. NUMBER OF CHANCES :**

Deleted vide Medical Council of India Notification on Graduate Medical Education (Amendment) Regulations 2003, published in the Gazette of India Part III, Section 4, Extraordinary issued on 30th September 2003.

## **12. MIGRATION**

- a. Migration from one medical college to another is not a right of a student. However, migration of

students from one medical college to another medical college in India may be considered by Medical Council of India, only in exceptional cases on extreme compassionate grounds, provided following criteria are fulfilled. Routine migrations on other grounds shall not be allowed.

- b. Both the colleges, i.e., one at which the student is studying at present and one to which migration is sought, should have been recognised by the Medical Council of India.
- c. The applicant candidate should have passed first professional MBBS examination.
- d. The applicant candidate should submit his/her application for migration complete in all respects, to all authorities concerned within a period of one month of passing (declaration of results) the first professional Bachelor of Medicine and Bachelor of Surgery (MBBS) examination.
- e. The applicant candidate must submit an affidavit stating that he/she will pursue 18 months of prescribed study before appearing for II professional MBBS examination at the transferee medical college, which should be duly certified by the Registrar of the concerned University in which he/she is seeking transfer. The transfer will be applicable only after receipt of the affidavit.

**NOTE I:**

- i. Migration during clinical course of study shall not be allowed on any ground.
- ii. All applications for migration shall be referred to Medical Council of India by college authorities. No Institution/University shall allow migration directly without the approval of the Council.
- iii. Council reserves the right, not to entertain any application which is not under the prescribed compassionate grounds and also to take independent decisions where applicant has been allowed to migrate without referring the same to the Council.

**NOTE II: \*** Compassionate grounds criteria:

- i. Death of a supporting parent or guardian
- ii. Illness of the candidate causing disability
- iii. Disturbed conditions as declared by Government in the Medical College area.

Particulars of course contents, scheme of examination etc., of Phase III subjects have been notified separately vide no. ACA/MBBS/ORD-3/2000-01 dated 25.01.2001.

### **13. ELIGIBILITY TO JOIN PHASE II OF THE COURSE**

Only candidates who pass in all the Phase I (Pre Clinical) subjects shall be eligible to join the Phase II of the course.

14. Particulars of course contents, scheme of examination etc., of Phase III subjects have been notified separately vide no. ACA/MBBS/ORD-3/2000-01 dated 25.01.2001.

# SECTION IV

## COURSE CONTENTS ANATOMY

### A. Goals & Objectives

#### Goals

The broad goal of teaching of Anatomy is to prepare students with basic knowledge of structure and its correlation with function, growth and development of human body and to apply the knowledge in clinical practice.

#### Objectives

At the end of the course, the student should be able to:

#### Knowledge:

1. Comprehend the normal disposition, clinically relevant interrelationship, functional and cross-sectional anatomy of various structures in the body.
2. Identify the microscopic structure and correlate elementary ultra structure of various tissues and organs and correlate the structure with the functions as a pre-requisite for understanding the altered state in various disease processes.
3. Comprehend the basic structure and connections of the central nervous system to analyse the integrative and regulative functional of the organs and systems. He/ She should be able to locate the site of gross lesions according to the deficits encountered.
4. Demonstrate knowledge of principles and sequential development of the organs and systems, recognise the critical stages of development and the effects of common teratogens, genetic mutations and environmental hazards. He/she should be able to explain the developmental basis of major various abnormalities.
5. Point out the features of various appearances of normal human body in skiagrams after routine Radiological investigations.
6. Understand the principles of karyotyping and identify the gross congenital anomalies.
7. Understand the principles of newer imaging techniques and interpretation of CT Scans and Sonograms.
8. Understand clinical basis of some common clinical procedures i.e., intramuscular, intravenous

injections, lumbar puncture and kidney biopsy.

- Understand different types of Bio-medical waste, their potential risks and their management.

### Skills

- Identify and locate structures of the body and mark the topography of living anatomy.
- Identify the organs and tissues under microscope.

### Integration

From the integrated teaching of other basic sciences, radiology and surgery the students should be able to comprehend the regulation and integration of the functions of the organs and systems in the body, thus interpret the anatomical basis of disease process.

### SYLLABUS AT A GLANCE FOR M.B.B.S. PHASE - I COURSE

General Anatomy	Basic tissues of the body Terminology and Nomenclature. History of Anatomy.
Elements of Anatomy	Osteology
	Arthrology
	Myology
	Angiology
	Neurology
Regional Anatomy	Upper limb, Lower limb, Thorax- including diaphragm Abdomen including Pelvis, Head and Neck, Brain and Spinal cord
Gen-Embryology	Development of individual organs and systems. Postnatal Growth & Development
Histology	General Histology, Microanatomy of individual organs and systems
Human Genetics	Principles of Human Genetics and Molecular Biology.
Radiological Anatomy	Skiagrams, Special X- Rays and CT scan
Surface Anatomy	In cadavers In the living
Sectional Anatomy	Head and Neck, Brain, Thorax, Abdomen including Pelvis
Applied Anatomy	
Bio-medical Waste	Types, potential risks and their safe management.

### 1. THEORY

#### General Embryology:

- a. Definition of embryology, brief account of male and female reproductive system, gestation period - subdivisions; testis, ovary; definition of gamete; sperm, ovum, gametogenesis, migration of primordial germ cells into gonadal ridge; structure of sperm, growth of ovarian follicles, and uterine cycle.

- b. Principles of Family Planning (contraception), Invitro fertilisation (for integrated teaching)

### **First week of Development**

2. Definition and process of fertilisation, formation of zygote; cleavage, formation of morula and blastocyst; implantation; formation of decidua- its subdivision. Types of implantation and abnormal sites of implantation.

### **Second week of Development**

3. Differentiation of embryoblast and trophoblast; changes in the embryo blast, bilaminar germ disc; changes in the trophoblast, formation of cytotrophoblast, syncytiotrophoblast, amniotic membrane, yolk sac, extra embryonic mesoderm, extra embryonic coelom, connecting stalk, formation of chorion, amniotic cavity, primary yolk sac and appearance of prochordal plate.

### **Third week of Development**

4. Appearance of primitive streak and primitive node; formation of intraembryonic mesoderm resulting in trilaminar germ disc; formation of notochord, buccopharyngeal and cloacal membranes, pericardial sac, paraxial, intermediate and lateral plate mesoderm, secondary yolk sac, intraembryonic coelom and allantonic diverticulum; derivatives of ectoderm, endoderm and mesoderm.

### **Fourth to Eight week of Development**

5. Formation of somites, neural tube, cephalocaudal folding, lateral folding, body form, stomodeum, proctodeum, gut and vitelline duct; subdivisions of gut into foregut, midgut and hindgut.

### **Placenta**

6. Formation of placenta and chorionic villi; decidua basalis; features and functions of placenta; placental circulation; abnormalities, placental barrier and types of placentae.

### **Umbilical Cord**

7. Formation and features of umbilical cord

### **Amniotic Cavity**

8. Amniotic cavity and membrane; amniotic fluid - functions, expansions of amniotic cavity and fusion with chorion; chorion laeve with decidua basalis, decidua capsularis and decidua parietalis, obliteration of chorionic and uterine cavities, function of fused foetal membranes to dilate cervical canal.

9. Formation and types of twins and multiple pregnancies. Conjoined twins.

## **Teratology**

10. Genetical and environmental factors as causes for congenital malformations.

## **II. Systemic Embryology**

1. Development of individual organs of the respiratory system, cardiovascular system, digestive system, urinary system, genital system and nervous system. Special sensory organs (in brief), endocrine glands and mammary gland.
2. Developmental abnormalities.
3. Development of skeletal system, muscular system (in brief)
4. Development of face, branchial apparatus and associated congenital anomalies.

## **III. Osteology**

Names of bones of the body and their positions; classification of bones with examples; general features, general pattern of blood supply; particular features; relations of blood vessels and nerves to bones. [Desirable to know determination of age (Ossification)]

Skull - All normae and interior of skull, foetal skull, mandible. Identification of individual skull bones.

## **IV. Muscular System**

Classification and identification of the muscles of the body; main attachments, nerve supply and actions; Actions of muscle groups on functional basis with reference to joints.

## **V. Arthrology**

Classification of joints, general features of different types of joints, detailed study of the following joints of the body with movements: temperomandibular, atlanto occipital, atlanto axial, shoulder, elbow, radio ulnar, wrist, carpo metacarpal joint of thumb. Hip, knee, ankle and sub talar joint. Intervertebral and sacroiliac joint.

## **REGIONWISE**

Thorax

## **VI. Cardio - Vascular System**

1. Pericardium, position and parts of the heart, conducting system, blood supply and nerve supply of heart, names of the blood vessels and their distribution in the body; region wise.
2. Developmental anomalies (as part of embryology)

## **VII. Respiratory System**

### **Chest wall including breast**

Pleura and lungs - position, parts, relations, blood supply and nerve supply. Lungs - emphasis on Bronchopulmonary segments.

Mediastinum - Superior its contents: Inferior - anterior, middle and posterior - thoracic aorta - thoracic duct, oesophagus and azygos system of veins.

Diaphragm - with nerve supply.

## **VIII. Abdomen**

Peritoneum - General disposition - horizontal and vertical; viscerae - general disposition, position, parts, relations, blood supply and nerve supply of abdominal organs.

## **IX. Pelvic and perineum**

Parts, position, relations, blood supply and nerve supply.

## **X. Endocrinial System and Individual Endocrine Glands (Regionwise)**

1. Organs, relations, blood supply, nerve supply, microscopic anatomy and normal development
2. Clinical manifestations of common endocrine disorders.

## **XI. Nervous System and its Components :**

Parts of nervous system, meninges, ventricles, motor and sensory pathways, cranial nerves, functional areas, normal development, microscopic anatomy of neurons, motor and sensory, cortex and their blood supply with cross sectional studies and morphology of spinal cord.

General features of medulla oblongata, pons, midbrain, cerebellum and cerebrum

Sections of Medulla	a) At Pyramidal decussation b) Sensory decussation c) Open part of Medulla
Pons	a) Lower pons b) Upper pons
Midbrain	a) Inferior colliculus b) Superior colliculus
RR	
Cerebellum	Horizontal
Cerebrum	a) Mid Saggital section b) Horizontal section at interventricular foramen c) Coronal section at anterior commissure d) Coronal section at mammillary body.

2. Common neurological disorders : case studies and demonstration.

## **XII. Special Sensory Organs**

Gross anatomy of eyeball, ear, nose and tongue.

## **XIII. Lymphatic System**

1. Spleen and Thymus
2. Gross anatomy of the major groups (region-wise) of the lymph nodes of the body and their drainage areas. Gross anatomy of the major lymphatics especially thoracic duct and its tributaries.

## **XIV. Micro Anatomy**

12 General topics, 15 systemic topics, (wide separate list attached) Study of microscopes and artefacts.

1. General Histology, study of the basic tissues of the body; functional correlation of the structural components of the organs.
2. Systemic histology of concerned organs.

## **XV. Postnatal Growth and Development (For Integrated Teaching)**

1. Meaning of the terms like growth, development, principles of growth and development, types of postnatal growth, periods of growth and development and factors influencing them. Assessment of growth and development, Genetic aspects of Growth & development.
2. Milestones of development, growth and development during adolescence, (for integrated teaching)

## **XVI. Radiological Anatomy**

Identification of normal anatomical features in skiagrams, including special radiological investigations (Barium studies, Intra Venous Urogram, Ultrasound, Hysterosalpingography, Cholecystography, CT Scan and MRI).

## **XVII. Surface Anatomy**

Surface features of the body and projections, outline of heart, lungs, pleura, liver, kidneys, ureter and important blood vessels and nerves.

## **XVIII. Cross Sectional Anatomy**

Cross sections of head and neck, thorax, abdomen and pelvis at different levels to understand the interrelations of organs at the following levels:

THORAX - T-3, T-4, T-5 Levels - Horizontal section

**ABDOMEN** - L-1, L-2, L-4 Levels - Horizontal section

**Pelvis** - Saggital section of male and female

**Head & Neck** - Mid saggital section and horizontal sections at C4 & C6

**Brain** - already mentioned - In Neuro anatomy

## **XIX. Genetics - 9 Lectures & Practicals**

Introduction - DNA, RNA, Protein Synthesis, Mitosis and Meiosis, Chromosomes - Methodology, Chromosomal abnormalities - Non dysjunction, Numerical abnormalities, (Downs, Turners and Kline felters Syndrome), congenital abnormalities (structure, deletion, translocation, inversion), pedigree Q chart, types of inheritance, autosomal dominant & autosomal recessive, inborn errors of metabolism and genetic counseling.

## **XIX. Bio-medical Waste** : Types, potential risks and their safe management.

## **2. PRACTICALS**

### **GROSS ANATOMY : Time : Total 32-34 Wks.**

Upper Limb :	Dissection :	Pectoral, scapular and shoulder region, arm, forearm (5 wks) Prosected parts : Joints, Palm and dorsum of hand.
Thorax :	Dissection :	Chest wall, breast, mediastinum, lungs, and heart. Cross sections at T-3, T-4 and T-5 Levels (3 wks)
Abdomen :	Dissection :	Anterior abdominal wall and inguinal region. Viscera and posterior abdominal wall- Cross sections at L-1,L-2 and L4 levels (4 wks.)
Pelvis :	Dissection :	Pelvic viscera, blood vessels and nerves - saggital section of male and female (2 wks) Prosection Parts : Perineum including ischio- rectal fossa
Lower Limb :	Dissection :	Gluteal region, front, medial and back of thigh, popliteal fossa, leg and dorsum of foot. (4 wks) Prosected Parts : Sole of the foot and joints.

Head & Neck :	Dissection :	Scalp, Superficial and deep dissection of face and neck. (8wks to 10 wks).  Prosected Parts: Orbit, eyeball, submandibular region, Temporal and infratemporal fossa, cranial cavity, naso and oropharyngeal regions, Ear, larynx and pharynx. Cross sections at C-4 and C-6 levels. Saggital section of Head & Neck.
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## Nervous System

Sections of brain and Prosected Specimens of sections of the brain and major functional areas. Gross structure of brain and spinal cord and study of gross sections as mentioned earlier.

## Demonstrations

- Bones-as described in osteology section
- Brain and spinal cord
- Cross- sectional anatomy
- Radiological anatomy
- Ultrasound, CT and MRI

## Microscopic Anatomy

Stained slides of all the tissues and organs.

## Developmental Anatomy

- Models to demonstrate various stages of early foetus and different organ development.

## Genetics

### Demonstration of :

1. Karyotyping, Normal XX and Normal XY, Mitosis & Meiosis,
2. Karyotype and clinical features of Downs, Klinefelter's and Turners Syndrome, Buccal Smear and different banding photographs.
3. Pedigree of case given, Pedigree of student and demonstration of dermatoglyphics.

### Specific Skills : Students should learn the following skills

1. To demonstrate surface marking of important organs
2. To localise important pulsations and where pressure can be applied in case of bleeding from a particular artery.
3. To locate superficial and deep reflexes.

4. To demonstrate muscle testing and movements at joints.
5. To locate sites for: Lumbar puncture, sternal puncture, pericardial tapping and liver biopsy.
6. To locate veins for venae puntre.
7. To locate site for emergency tracheostomy.
8. To locate the subcutaneous positions of large nerves.
9. Preparation of Histology drawings.

## **HISTOLOGY**

Practical classes (of 2 hrs. duration) together with 1 hour Lecture.

### **General Histology**

1. Microscope
2. Cell
3. Epithelial Tissue I
4. Epithelial Tissue II
5. Connective tissue
6. Muscular tissue
7. Nerve tissue - TS & LS of peripheral nerve, optic nerve, sensory & sympathetic ganglia.
8. Epithelial glands (serous, mucous and mixed salivary glands)
9. Circulatory system (large sized artery, medium sized artery, large sized vein,)
10. Lymphatic System (lymph node, thymus, tonsil and spleen)
11. Skin & its appendages
12. Placenta & umbilical cord

### **Systemic Histology**

1. Respiratory system - trachea and lung
2. Digestive system - Lip, tongue, oesophagus, stomach, small and large intestine, Liver, gall bladder and pancreas.
3. Urinary System - kidney, ureter, urinary bladder and urethra
4. Reproductive System - female - ovary, ovarian tube and uterus
5. Reproductive System - male - testis, epididymis, vasdeferens and prostate gland.
6. Hypophysis cerebri, thyroid and suprarenal
7. Eye (Cornea and Retina)
8. Neuro histology - The slides to be shown for Neuro histology are given below:

Spinal Cord	i. Cross section (CS) at mid thoracic level
Medulla	i. C. S. at Pyramidal level
	ii. C. S. at Sensory deccusation
	iii. C. S. at open part of Medulla
Pons	i. CS. at lower pons
	ii. C. S. at upper pons
Midbrain	i. C. S. inferior colliculus
	ii. C. S. at superior colliculus

Cerebral Cortex	i. granular cortex
	ii. agranular cortex
Cerebellum	Structure of cortex

#### Note :

Desirable to know (for teaching and demonstration only not for evaluation)  
 Histology of Mammary Gland, seminal vesicle, penis, lacrimal gland and eyelid and ear.

#### C. Teaching Hours

Lectures	- 4 Hrs. per week
Tutorials	- 1 Hr. per week
Group Discussion	- 1 Hr. per week
Practicals	
Histology	- 2 Hrs. per week
Dissection	- 8 Hrs. per week (total: 16 hours per week approximately)

#### Area for Integrated Teaching (Vertical Integration)

Organising Department : **Anatomy**

Sl. No.	Area/Subject	Department(s) to be involved
1.	Anatomical basis of birth control measures	Obstetrics & Gynaecology and Surgery
2.	Postnatal growth and development	Paediatrics and Community Medicine.
3.	Antenatal growth and development	Obstetrics & Gynaecology & Community Medicine.
4.	Genetics disorders	Various clinical departments
5.	Neuro-Anatomy	Physiology and Medicine.
6.	Kinesiology-movements at various joints	Orthopaedics
7.	Embryological basis of important & common congenital anomalies	Paediatrics, Obstetrics and Gynaecology.

#### D. SCHEME OF EXAMINATION

##### INTERNAL ASSESSMENT

Total Marks : 80 - Theory 60 and Practical 20

##### THEORY: 60 Marks

Minimum of three examinations are recommended. The sessional examination preceding the university examination may be similar to the pattern of university examination. Average of any two best marks obtained in the notified internal examinations may be taken into consideration for calculating internal assessment. The total marks be reduced to 60 and sent to the university.

## **PRACTICALS: 20 Marks**

There will be two terminal practical examinations. Five marks will be for records and 15 marks for terminal tests. Average marks of the two terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and sum of the two shall be sent to the university.

The internal assessment marks both theory and practical obtained by the candidates should be sent to the university at least fifteen days prior to the commencement of theory examination.

## **UNIVERSITY EXAMINATION**

### **A. THEORY : 200 Marks**

There shall be two theory papers of 100 marks each and duration of each paper will be of 3 hours. Distribution of chapters for paper I and II with weightage of marks in Anatomy for University Examination

<b>PAPER - 1</b>	
<b>Topics</b>	<b>Marks</b>
Head and Neck	30
Brain, Spinal cord	10
Upper limb	20
Thorax including diaphragm	20
General Anatomy	20
General Embryology	
General Histology	
<b>Total</b>	<b>100</b>

<b>PAPER - 2</b>	
<b>Topics</b>	<b>Marks</b>
Abdomen	30
Pelvis & Perineum	20
Lower limb	20
Systemic Histology - 10 }	
Genetics - 10 }	30
Systemic Embryology - 10 }	
<b>Total</b>	<b>100</b>

**Chapterwise distribution of type of Questions and Marks will be as under \*:**  
The pattern of questions would be of three types.

### **Paper - 1**

Head & Neck, Brain and Spinal cord, Thorax including diaphragm and upper limb and also relevant Systemic Embryology	Long Essay 2 x 10 Marks	20
Head & Neck, Brain and Spinal cord, Thorax including diaphragm and upper limb and General & Systemic Embryology & Histology	Short Essays 10 x 5 Marks	50
General Anatomy, General Histology, General Embryology and also Head & Neck, Brain and Spinal cord, Thorax including diaphragm and upper limb also relevant Systemic Embryology & Histology	Short Answer 10 x 3 Marks	30

## Paper - 2

Gross Anatomy of Abdomen, Pelvis and Lower limbs and relevant Systemic Embryology	Long Essay 2 x 10 Marks	20
Gross Anatomy of Abdomen, Pelvis and Lower limbs and relevant Systemic Embryology & Histology + Genetics	Short Essays 10 x 5 Marks	50
Relevant Systemic Histology, Embryology, Genetics and also Abdomen, Pelvis and Lower limbs	Short answer 10 x 3 Marks	30

\* The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

### B. PRACTICAL : 80 Marks

#### Gross Anatomy : 50

- a. Spotters: Identification of structures in given specimen, each carrying two marks. Five specimens to be kept, one of which shall be a cross section = 10 marks
  - b. Discussion on two given dissected specimens, each carrying 15 marks  
Structures above diaphragm and diaphragm - 15 marks  
Structures below diaphragm - 15 marks = 30 marks
  - c. Surface Anatomy = 10 marks
- 
- a + b + c = 50 marks**

#### Histology- 30 marks

- a. Identification of 9 slides and interpretation of one chart on genetics, each carrying one mark = 10 marks
  - b. Discussion on two given slides 10x2 = 20 marks
- 
- a + b = 30 marks**

### C. Viva-Voce Examination : 40 Marks

The Viva-Voce examination will be conducted by four examiners individually. The distribution of topics and marks for each examiner will be as under :

- I Questions on embryology (with models) 10 marks
- II Radiological anatomy including ultrasound, C.T. and MRI 10 marks
- III Osteology and soft parts in the regions of head and neck, brain and spinal cord, thorax including diaphragm and upper limb. 10 marks
- IV Osteology and soft parts in the region of abdomen, pelvis and lower limb 10 marks

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**40 marks**

The Viva-Voce examination will be conducted by four examiners individually. The distribution of topics and marks for each examiner will be as under :

i	Questions on embryology (with models)	10 marks
ii	Radiological anatomy including ultrasound, C.T. and MRI	10 marks
iii	Osteology and soft parts in the regions of head and neck, brain and spinal cord, thorax including diaphragm and upper limb.	10 marks
iv	Osteology and soft parts in the region of abdomen, pelvis and lower limb	10 marks

#### e. RECOMMENDED TEXT AND REFERENCE BOOKS:

##### TEXT BOOKS

1. SNELL (Richard. S), Clinical Anatomy for Medical Students, Ed. 7, William and Wilkins, Lippincott 2003, p1012, \$45.
2. MOORIE (Kieth L), Clinically Oriented Anatomy, ed. 4., Williams and Wilkins, Baltimore, 1999, p1167, \$40.
3. DATTA (A.K), Essentials of human anatomy : Thorax and Abdomen ed.6. Vol. I, Current Book International; Calcutta. 2003, p380. Rs.300/-

DATTA (AK), Essentials of human anatomy; Head and Neck. Ed 3. Vol II, Current Book International, Calcutta 2004 reprint, p373. Rs.250/-

DATTA(A K), Essentials of human anatomy: Neuroanatomy, Ed. 2, Vol. IV Current Book International, Calcutta, 2000, p291. Rs.200/-

4. SINGH (Inderbir), Text Book of anatomy with colour atlas: Introduction, Osteology, Upper extremity, Lower extremity, Ed. 3, Vol I, JP brothers, New Delhi. 1996, p448, Rs.325/-

SINGH (Inderbir), Text Book of anatomy with colour atlas: Thorax and abdomen, Ed. 3, Vol. II JP brothers, New Delhi. 1996, Rs. 275/-

SINGH (Inderbir), Text Book of anatomy with colour atlas: Head & Neck Central Nervous System, Ed. 3, Vol. III JP brothers, New Delhi. 1996, Rs. 300/-

5. SINGH (Inderbir), Human Osteology, Ed. 2, JP brothers, New Delhi. 1990. P191, Rs.150/-

##### PRACTICALS

1. ROMANES (G J), Cunningham manual of practical anatomy : upper and lower limb ed. 15. Vol. I Oxford Medical Publication, Oxford 1996. P263. Rs.410/-

2. ROMANES (G J), Cunningham manual of practical anatomy : thorax and abdomen. Ed 15. Vol II. Oxford Medical publication, Oxford. 1996. P298. Rs.410/-
3. ROMANES (G J), Cunningham manual of practical anatomy : Head and Neck and brain ed. 15. Vol III. Oxford Medical publication, Oxford 1996. p346. Rs.410/-

### **HISTOLOGY:**

1. SINGH (Inderbir), Text Book of Histology, ed. 4, Jaypee brothers, New Delhi, 2002, p354.
2. COPENHAVER (WM), Bailey's Text book of Histology, ed. 16, Williams and Wilkins. Baltimore. 1971. p745.

### **EMBRYOLOGY:**

1. MORRIE (Keith L) and PERSAUD (TVN), The Developing Human Clinically oriented Embryology, Ed. 7, W B Saunders, Philadelphia, 2003, p560, Rs. 995/-
2. LANGMAN, Medical Embryology: human development-normal-abnormal. Ed.9, William and Wilkins, Baltimore, 2004, p534. \$ 25.
3. DATTA (A K), Essentials of Human Embryology. Ed.4, Current Books International, Calcutta, 1995, p310, Rs.200/-
4. SINGH (Inderbir), Human Embryology, Ed.7, Macmillan India Ltd., Madras, 2001, p391, Rs. 248 /-

### **NEUROANATOMY:**

1. DATTA (A K), Essentials of Anatomy: Neuroanatomy, Ed 2, Current Book International, Calcutta, 2000, p291. Rs.200/-.

### **REFERENCE BOOKS**

1. WILLIAMS (Peter L) Gray's Anatomy. Ed. 38 Churchill Livingstone, 2000, p2092
2. DECKER (CAG) and DJ DUPLESSIS, Lee Megregor's synopsis of surgical anatomy, ed. 12. K M Varghese and Co., Bombay. 1986, p626, Rs.375/-
3. McMINN (RMH), Last's Anatomy regional and applied, ed. 10, ELBS, UK, 1992 P707. L8-95

4. BASMAJIAN (J V), Grant's method of anatomy, ed 11, Williams and Wilkins Baltimore. 1989, p615, \$20.

## **ATLAS**

1. ROSS (Michael. J D) et. al., Histology; text and atlas. Ed 3. Williams and Wilkins, Baltimore. 1995, p823 \$20.00
2. DIFIORE (Mariand. S H), Atlas of normal histology, Ed 9. Williams and Wilkins, Lippincott, 2000, P363.

## **SURFACE ANATOMY:**

1. ROBINSON (Rawling J O), Landmarks of surface markings of the human body, Ed 9. Lewis and Co., 1953.p
2. HALIM (A), Surface and Radiological Anatomy, Ed 2, CBS. Publishers and distributors, New Delhi, 2002 (reprint), p225. Rs.110/-

## **GENETICS:**

1. EMERY (Alan H) and MULLER (Robert F), Elements of Medical Genetics; Student Notes. Ed 11, ELBS, UK, 1992, p372, £15.

# **PHYSIOLOGY**

## **Objectives**

At the end of the course, the student should be able to:

1. Describe the normal functions of all organ systems, regulatory mechanisms and interactions of the various organs for well co-ordinated total body function.
2. Understand the basic principles, mechanism and homeostatic control of all the functions of human body as a whole.
3. Elucidate the physiological aspect of normal growth and development.
4. Analyse the physiological responses and adaptation to different stresses during life Processes.
5. Lay emphasis on applied aspect of physiological functions underlying disease state.
6. Correlate knowledge of physiology in areas indicated by National Health Programmes.
7. Acquire the skills to do the experiments for study of physiological function.
8. Interpret experimental and investigative data.
9. Distinguish between normal and abnormal data derived as a result of tests which he / she performed and observed in the laboratory.
10. Understand different types of Bio-medical waste, their potential risks and their management.

## **Course Contents**

### **Theory**

#### **i. GENERAL PHYSIOLOGY**

(8 Hrs.)

1. Homeostasis, concepts of physiological norms, range and variations, active and passive Transport, relationship between stimulus and response.
2. Structure of cell membrane, resting membrane potentials, cellular receptors, intercellular Communications.
3. Body fluids - Compartments, changes in body fluid compartments, hypoproteinaemia Replacement of body fluid loss.

#### **ii. BLOOD AND LYMPH.**

(16 Hours)

Blood composition, cellular elements of blood their formation and regulation. Haemoglobin - Synthesis and functions, jaundice, anaemias and their classification, haemostatic mechanisms, anticoagulants, blood groups, Rh incompatibility, blood transfusion; ESR, Basic mechanisms of

immunity and functions of WBCs, Lymph- composition, circulation and functions.

### **III. NERVE AND MUSCLE**

(8 Hours)

Classification of nerves, muscle. Structure of skeletal muscle. Types of muscle fibres mechanism of contraction and its Molecular basis. Thermal and chemical changes during muscle contraction; oxygen debt. Neuromuscular transmission. Neuromuscular blocking drugs. Neuromuscular disorders, Pathophysiology of Myesthemia gravis.

### **IV. GASTROINTESTINAL TRACT**

(12 Hours)

Functional morphology. Smooth muscle - structure, mechanism of contraction and nerve supply and neurotransmitters, composition, function and regulation of secretion of salivary glands, stomach, small intestine and large intestine; regulation of gastrointestinal movements; functions of gall bladder, liver, site of production and actions of GI hormones, Mechanism - intestinal absorption of food. Physiological basis of peptic ulcer diarrhea and constipation, motility disorders - Achalasia, Hirschsprung's disease.

### **V. KIDNEY**

(10 Hours)

Functions of different parts of nephron in urine formation. Role of kidney in water and electrolyte balance, Acidification of urine, diuresis, kidney function tests. Juxtaglomerular apparatus. Renin - Angiotensin system, Renal blood flow, structure and innervations of bladder; micturition, Cystometrogram, disorders of micturition, principles of artificial kidney.

### **VI. SKIN AND BODY TEMPERATURE (ENVIRONMENT)**

(2 Hours)

Structure and functions of skin, Regulation of Body temperature.

### **VII. ENDOCRINE GLANDS**

(16 Hours)

(To be integrated with Biochemistry)

General principles of regulation of endocrine glands. Hormones, functions cellular mechanism of hormone action, regulation of secretion. Experimental and clinical disorders of anterior and posterior pituitary, thyroid, parathyroid, adrenal cortex and medullar and endocrine pancreas. Stress and hormones, physiology of growth. Minor endocrine glands - Pineal body, heart, and kidney.

### **VIII. REPRODUCTION**

Sex determination and differentiation.

1. Male Reproduction: functions of testis, constituents of semen, testicular hormones, spermatogenesis and regulation. (3 Hours)
2. Female Reproduction : Mestrual cycle : Changes in ovary, uterus, cervix, vagina and hormonal regulation. Ovulation and its detection, fertilization, implantation, physiological changes during pregnancy, Foetoplacental unit; nutritional needs of mother during pregnancy. Parturition, lactation, Composition of breast milk, placenta, menopause. Physiology of newborn. (8 Hours)

3. Family Planning and Welfare : Physiological basis of contraception in males and females. Principles of use of oral contraceptives, safe period, rhythm and other methods of contraception. (4 Hours)

## **IX. CARDIOVASCULAR SYSTEM** (25 Hours)

Functional anatomy of heart, properties of cardiac muscle, principles of electro cardiology, electrical and mechanical changes in cardiac cycle, conducting system of heart, normal ECG. Cardiac output measurement in man, physiological variations. Regulatory mechanisms of heart rate and blood pressure. Regional circulations: normal values, physical principles governing flow of blood in heart and blood vessels, measurement and regulation of coronary, cerebral, skin. Foetal circulation, changes in CVS during muscular exercise, postural changes, hypovolemia, hypoxia, and cardiopulmonary resuscitation. Microcirculation, Haemodynamics, pathophysiology of hypertension, shock, cardiac failure and coronary artery disease.

## **X. RESPIRATORY SYSTEM** (12 Hours)

Functional anatomy of respiratory system. Mechanics of normal respiration. Physical principles governing flow of air in respiratory passages. Lung compliance, alveolar ventilation, ventilation perfusion ratio, oxygen and carbon dioxide transport, diffusing capacity, pulmonary function tests, Regulation of respiration, respiratory acidosis and alkalosis, pulmonary blood flow. Hypoxia, cyanosis, asphyxia. Respiratory adjustments during muscular exercise, hyperbaric conditions, principles of oxygen therapy, artificial respiration. Hyaline membrane disease. Pathophysiology of obstructive and restrictive disorders. Pulmonary oedema, decompression sickness, hyperbaric oxygen therapy, dyspnoea.

## **XI. CENTRAL NERVOUS SYSTEM** (30 Hours)

1. Organisation of the central nervous system. Functions and neuronal organisation at spinal cord level. Synaptic transmission. Motor and sensory systems and their lesions. Reticular system in brain stem, sleep, wakefulness, EEG waves and physiological changes in EEG. Clinical lesions and experimental sections at spinal cord, brain stem and sub-cortical levels. Physiology of basal ganglia, cerebellum, thalamus, hypothalamus, limbic system, prefrontal lobe and cerebral cortex. Speech and its disorders. Autonomic nervous system. Formation, circulation and functions of CSF. Blood brain barrier, central Neurotransmitters, Neuroglia. Physiological Basis of CNS disorders like Alzheimer's disease, Parkinsonism, Syringomyelia, Tabes dorsalis.

## **XII. SPECIAL SENSES** (10 Hours)

Eye : Functional anatomy of eye. Image formation on retina. Structure of photoreceptors electrical activity of photoreceptors. Errors of refraction, functions of aqueous humour, intraocular tension. Mechanisms of accommodation, dark adaptation, pupillary reflexes, functions of retina. Optic pathway and lesions. Role of visual cortex in perception. Field of vision. Colour vision, Acuity of vision, photochemistry of vision. Nutritional deficiency -blindness.

### **Auditory Apparatus :**

1. Functional anatomy of the ear, physics of sound (basic)
2. Role of tympanic membrane, middle ear, cochlea in hearing.
3. Auditory receptors and pathway
4. Deafness and its causes, principles of audiology, tuning fork tests and its interpretation.

### **Vestibular Apparatus :**

Structure and functions, connections and lesions of Vestibular apparatus.

### **Taste and Smell :**

Modalities, receptors, pathway, cortical and limbic areas associated with taste and smell.

## **XIII. Bio-medical Waste : Types, potential risks and their safe management.**

## **PRACTICAL**

The following list of practical is minimum and essential. Additional exercises can be included as and when feasible and required. All the practicals have been categorized as 'Procedures' and 'Demonstrations'. The procedures are to be performed by the students during practical classes to acquire skills. Some of these would be included in the practical during University examination. Those categorized as "Demonstrations" are to be shown to students during practical classes. However, these Demonstrations would not be included in the university examinations, but questions based on these would be given in the form of data, charts, problems and case - histories, for interpretation by students.

### **Procedures to be performed by the students:**

#### **I. Haematology:**

1. RBC count
2. WBC Count
3. Differential Leucocyte Count
4. Estimation of haemoglobin
5. Blood grouping
6. Bleeding time
7. Clotting time
8. Absolute Eosinophil Count
9. Erythrocyte Sedimentation Rate
10. Determination of blood indices - MCV, MCH, MCHC and Colour Index.

#### **II. Procedures to be performed on human subjects**

1. Mosso's ergometry - at normal condition, after venous occlusion and arterial occlusion.
2. Recording of Blood Pressure, effect of posture and exercise on it
3. Stethography - at rest, effect of deglutition, exercise, voluntary hyperventilation and break point after breath holding, breathing through long tube, rebreathing through bag.
4. Spirometry - lung volumes and capacities, MVV and Dyspnoeic Index, FEV1.

5. Peak Expiratory Flow Rate (PEFR) by Wright's mini peak flow meter
6. Cardiovascular fitness test - by Harvard's step test or bicycle ergometer or 2 km walk.
7. Visual field by Perimetry
8. Body composition - BMI (by Quetlet's Index) and Body Fat % by Durenberg's equation.
9. Recording of ECG in lead II.
10. Tests of autonomic functions.

### **III. Clinical Examination:**

1. Examination of radial pulse.
2. Clinical Examination of Cardiovascular system
3. Clinical Examination of Respiratory system
4. Examination of Cranial Nerves
5. Examination of Sensory system
6. Examination of Motor system
7. Examination of Reflexes.

### **IV. Interpretation of - Charts, Problems and Case histories**

#### **Recommended Demonstrations :**

1. Haematology: Haematocrit, Reticulocyte count, Platelet count, Osmotic fragility.
2. Nerve - Muscle Physiology: Electro myography (E.M.G.)
3. Cardiovascular system : Electrocardiography (ECG), Demonstration of sinus arrhythmias, Recording of Arterial pulse tracing.
4. Respiratory system "Determination of lung volumes and capacity, and other lung function tests by computerized spirometry.
5. Reproductive system : Sperm motility and Sperm count
6. Special senses: Audiometry, Purkinje - Samson's images, Ophthalmoscopy, Retinoscopy, Examination of fundus.
7. Nervous system : Autonomic function tests
8. Amphibian Practical : Muscle - nerve and heart experiments may be demonstrated if feasible for academic interest only and not for university practical examination as graphs on amphibian experiments are deleted.
9. Electro encephalogram (E.E.G)

#### **Teaching Hours and Methods**

##### **1. Total Number of Hrs. - 480**

Theory Didactic Lectures	- 160 Mrs.
Non Lecture teaching	- 80 Hrs.
Practical/Demonstrations	- 240 Hrs.

## **2. System wise Distribution of Teaching Hours**

Sl. No.	System	No. of Hrs.
1.	General Physiology, body fluids	8
2.	Blood and lymph	16
3.	Nerve-Muscle	8
4.	Gastro-Intestinal	12
5.	Kidney	10
6.	Skin, Body temperature	2
7.	Endocrine	16
8.	Reproduction	10
9.	Cardio Vascular	25
10.	Respiration	12
11.	Central Nervous System	30
12.	Special Senses	10

### **Scheme of Examination**

#### **Internal Assessment**

Total Marks : 80 (Theory 60 and Practical 20)

#### **Theory : 60 Marks**

Minimum of three examinations are recommended. The sessional examination preceding the University examination may be similar to the pattern of University examination. Average of any two best marks obtained in the notified internal examinations be taken in to consideration for calculating internal assessment. The total marks be reduced to 60 and sent to the University.

#### **Practical: 20 Marks**

There will be two terminal practical examinations. Five Marks will be for records and 15 marks for terminal tests. Average marks of the two terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and the sum of the two shall be sent to the University.

The internal assessment marks both theory and practical obtained by the candidates should be sent to the University at least fifteen days prior to the commencement of theory examination.

### **University Examination**

#### **A. Theory : 200 Marks**

There shall be two theory papers of 100 marks each and duration of each paper will be of 3 hours. The pattern of questions would be of three types.

Type of Questions	Number of questions	Marks for each questions	Total
Long Essay	2	10	20
Short Essay	10	5	50
Short Answer	10	3	30
<b>Total Marks</b>			<b>100</b>

**Distribution of chapters and suggested marks in parenthesis for Paper I and Paper II in Physiology for University examination are as follows\*:**

### **PAPFR-I**

General Physiology (4), Blood (20), Cardiovascular system (24), Respiratory system (20). Gastrointestinal system (20), Renal system (12). (Note: Marks for Renal and Gastrointestinal system can be interchanged. (Figures shown in parentheses are weightage of marks recommended for the different topics)

### **PAPER II**

Endocrine (20), special senses (20), Reproduction (12), Central Nervous System (28), Muscle-Nerve (16), Skin and Body Temperature (4), (Note: Marks for Endocrines and Reproduction can be interchanged. (Figures shown in parentheses are weightage of marks recommended for the different topics)

\*The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

### **B. PRACTICAL: 80 Marks**

There shall be two practical sessions, Practical I and II, each carrying 40 marks, each practical will be of 2 hrs., duration. The distribution of content and marks for the practical would be:

#### **Practical I : 40 Marks**

- 1. Clinical Examination - 20 marks
- 2. Human subjects - 20 marks

#### **Practical II : 40 Marks**

- 3. Haematology (Major) - 20 marks
- (Minor) - 10 marks

- 4. Interpretation of case histories / problems / charts - 10 marks

### **C. Viva-Voce Examination : 40 Marks**

The viva-voce examination shall carry 40 marks and all examiners will conduct the examination

Table 1 - Portions of Paper I	-	20 Marks
Table 2 - Portions of Paper II	-	20 Marks

### **Recommended Text Books and Reference Books**

Deciding which textbook to buy is not an easy task. Choice of a textbook depends on the individual and his or her aptitude. It is desirable, and would certainly be helpful if each student has one textbook out of the recommended list of textbooks. We suggest that you browse through, try each one out and take your time before you decide which one you would like to invest in suits your particular temperament and of course for you to fall back on if you really cannot afford to invest in a textbook of your own. Remembers there is no ideal textbook; all share their imperfections and yet each one of them has much to offer. Obviously cost is also an important criterion.

The list of books under the section Reference books are categorized under three levels of difficulty-level one being the easiest. The books under level one are meant to provide an overall. Simple but comprehensive account of physiology. Books at level two can be considered as alternative textbooks and some of them are excellent books for further reading. Level three books are really meant for purposes of reference during advanced study in any special area of Physiology.

### **TEXT BOOKS**

1. GUYTON (Arthur C), Text of Medical Physiology. Recent edn., Prism Publishers, Bangalore.
2. GANONG (William F), Review of Medical Physiology, Recent edn., Appleton and Lange.
3. VANDER et al. Human Physiology, recent edn.
4. SHLKURT (Evald E.), Basic Physiology for the health sciences, Little Borwn, Boston
5. CHAUDHURI (Sujith K), Concise Medical Physiology, New Central Books, Calcutta.
6. TORTORA (Gerald J), Principles of anatomy and physiology Harper Collins Ref. College Publication,
7. GABRIAL ENGEILA - Text book of Physiology
8. A.K.JAIN - Textbook of Medical Physiology.
9. BIJLANI (RL), Understanding medical physiology; text book for medical students, Jaypee brothers, New Delhi

### **REFERENCE BOOKS**

#### **Level 1**

1. MORAN Campbell E. J. Clinical Physiology, ELBS UK.

## **Level 2**

1. BERNE (Robert M) and Levy (Mathew), Physiology, Mosby Publication.
2. SCHMIDT (RF) and THEWS (G), Human Physiology, Springer Verlog, London.

## **Level 3**

1. MOUNTCASTLE (Veernow B), Medical Physiology.
2. PATTON (Harry d), Text book of Physiology
3. RAINER AND NINDHAERST- Text of Physiology- Springer, Verlog, London

## **Experimental Physiology**

There is no one textbook on experimental physiology and that may be recommended with impunity. However, there is certainly no need for an undergraduate medical student to invest in one. Some useful books to refer to are:

1. Ghai., A textbook of Practical Physiology.
2. McLeod, Clinical Examination
3. Hutchinson & Hunter, Clinical Methods.
4. A.K.Jain - Manual of practical physiology.

# BIOCHEMISTRY

## Goals & Objectives

### Goals

The knowledge acquired in Biochemistry should help the student to integrate molecular events with structure and function of human body in health and disease. Towards this, the departments would facilitate :

1. To enable students understand the scientific basis of life processes at the molecular level and orient them towards the application of knowledge acquired in solving clinical problems.
2. To acquire basic practical skills for biochemical investigations in order to support clinical diagnosis of common disorders in the community, and
3. To promote research activities for students and staff.
4. Understand different types of Bio-medical waste, their potential risks and their anagement.

### Objectives

At the end of the course, the student shall be able to :

1. Enlist and describe the cell organelles with their molecular and functional organisation.
2. Delineate structure, function and interrelationship of various biomolecules and consequences of deviation from normal.
3. Understand basic enzymology and emphasise on its clinical applications' wherein regulation of enzymatic activity is disturbed.
4. Describe digestion and assimilation of nutrients and consequences of malnutrition.
5. Describe and integrate metabolic pathways of various biomolecules with their regulatory mechanisms.
6. Explain the biochemical basis of inherited disorders with their associated sequelae.
7. Describe mechanisms involved in maintenance in water, electrolyte and acid base balance and consequences of their imbalances.
8. Outline the molecular mechanism of gene expression and regulation, basis principles of biotechnology and their applications in medicine.
9. Understand with basic immunology involving molecular concepts of body defence mechanisms and their applications in medicine.

10. Continue to learn advancements in biochemistry and apply the same in medical practice.
11. Understand different types of Bio-medical waste, their potential risks and their management.

## **Skills**

1. Conduct conventional and selected special investigations.
2. Analyse and interpret laboratory data.
3. Demonstrate skills for solving clinical problems to arrive at diagnosis using laboratory data.

## **Course Contents**

### **Theory**

#### **I. Introduction and Scope of Biochemistry**

#### **II. Cell and sub cellular structures (3 hrs.)**

- A. Cell membrane - composition
- B. Function of sub - cellular structures
- C. Transport across the cell membrane
  - a. Active transport
  - b. Facilitated diffusion
  - c. Receptor Mediation
  - d. Endocytosis

#### **III. Hydrogen Ion concentration, Acids, Bases, Buffers, Henderson Hasselbalch Equation (2 hrs)**

#### **IV. Isotopes, Radioactive Isotopes and their applications in Medicine (1 hr.)**

#### **V. Chemistry of Carbohydrates (4 hrs)**

- a) Definition, Classification and biological importance.
- b) Monosaccharides : structure, classification and properties.
- c) Isomerism and Stereoisomerism
- d) Oligosaccharides, Disaccharides - Structure and their importance
- e) Polysaccharides : Homo and Hetero polysaccharides - structure and their functions.

#### **VI Chemistry of Proteins, Amino Acids and Peptides (6hrs.)**

- a. Proteins: Definitions, Classifications and functions
- b. Amino acids : Classification, properties, side chains of amino acids, charge properties.
- c. Peptides : Biologically active peptides - Examples such as GSH, Insulin - its structure.
- d. Plasma proteins, functions and their importance in health and disease.
  - i. Definition
  - ii. Biological importance of proteins
  - iii. Classification, properties and charge properties
  - iv. Structural organisation, confirmation and denaturation.
  - v. Biosynthesis of creatinine phosphate and formation of creatinine

**VII Chemistry of Lipids** (4 hrs.)

- a. Definition, Classification and biological importance.
- b. Simple lipids : Triacylglycerol and waxes-structure and composition.
- c. Compound lipids : Phospholipids - Sphingolipids, Glycolipid - composition and functions.
- d. Derived lipids : Fatty acids - saturated, unsaturated, Steroids and their properties, Eicosanoids, Terpenes.

**VIII Chemistry of Nucleic Acids** (4 hrs.)

- a. Definition and biological importance
- b. Classification and composition.
- c. Purine - pyrimidine bases, nucleosides, nucleotides and biologically important nucleotides.
- d. DNA : Structure, functions and metabolism
- e. RNA : Types of RNA - Structure, functions and metabolism

**IX Enzymes and Clinical Enzymology** (7 hrs.)

- a. Definition, Classification, specificity, co-enzymes, co-factors and activators.
- b. Mechanism of enzyme action
- c. Factors affecting enzyme activity - km value and its importance.
- d. Enzyme inhibition : reversible and irreversible, competitive, other types and its clinical application.
- e. Regulatory enzymes: Pro-enzymes, isoenzymes, allosteric enzymes and feed back control.
- f. Diagnostic and therapeutic importance of enzymes including enzyme immunoassay.
- g. ELISA & RIA

**X. Vitamins** (9 hrs)

- a. Definition and Classification
- b. A brief account of chemistry, sources, deficiency diseases and biochemical role, Recommended dietary allowances (RDA)
- c. Vitamin antagonists
- d. Hypervitaminosis.
- e. A brief account of role of antioxidants and free radicals

**XI. Biological Oxidation** (3 hrs)

Mitochondrial electron transport chain, oxidative phosphorylation, mechanism, uncouplers and inhibitors.

**XII Digestion and absorption from gastrointestinal tract** (3 hrs)

- a. Digestion and absorption of carbohydrates, glucose transporters, lipids, proteins and nucleic acids.
- b. Malabsorption syndromes.

**XIII Carbohydrate Metabolism** (9 hrs)

- a. Glycogenesis, Glycogenolysis and Glycogen storage diseases.
- b. Glycolysis, Rapaport Leubering Cycle, Pyruvate Oxidation and Citric Acid Cycle.
- c. Pentose Phosphate Pathway.
- d. Uronic acid pathway

- e. Gluconeogenesis and Cori's cycle.
- f. Metabolism of Fructose and Galactose
- g. Regulation of metabolic pathways
- h. Disorders of carbohydrate metabolism
- i. Regulation of Blood Glucose, GTT, Diagnostic and Prognostic importance of glycated haemoglobin and Diabetes Mellitus.

**XIV Lipid Metabolism** (10 hrs)

- a. Oxidation of fatty acids, propionate metabolism, formation and utilization of Ketone bodies, ketosis, outline of the synthesis of Cholesterol (reactions up to Mevalonate in detail) breakdown of cholesterol and metabolic disorders of lipids.
- b. Lipogenesis, Denovo synthesis of fatty acids, chain elongation, desaturation, Phospholipid biosynthesis (Lecithin and Cephalin only) and their breakdown
- c. Fatty liver and lipotropic factors.
- d. Prostaglandins and their biological functions.
- e. Plasma lipoproteins - classification, functions and disorders.

**XV. Protein and amino acid metabolism** (10 hrs)

- a. Breakdown of tissue proteins and amino acid pool, general reactions of amino acids.
- b. Disposal of Ammonia : Urea cycle, glutamate and glutamine formation.
- c. Metabolism of amino acids (Glycine - Serine, sulfur containing amino acids, aromatic amino acids, Histidine & Arginine)
- d. Metabolic disorders of amino acids, Aminoacidurias
- e. Synthesis of creatinine, Phosphocreatine, formation of creatinine and clinical significance of creatinine clearance.

**XVI Purine and Pyrimidine Metabolism** (3 hrs)

- a. Sources of Purine and Pyrimidine ring, their biosynthesis and breakdown.
- b. Salvage Pathway
- c. Disorders of purine and pyrimidine metabolism.

**XVII Intermediary Metabolism** (2 hrs)

Introduction, Methods of study of Intermediary metabolism.

**XVIII Minerals** (4 hrs)

Calcium, Phosphorus, Iron, Copper, Iodine, Sodium, Potassium, Chlorides, Zinc, Fluoride, Magnesium, Manganese and Selenium.

**XIX Molecular Genetics and Protein Biosynthesis** (10 hrs)

- a. DNA RNA metabolism.
- b. Replication, transcription, reverse transcription and post transcriptional modifications.
- c. Translation - amino acid activation, initiation, elongation and termination, Post translational modifications and regulation of Gene expression
- d. Regulation of Gene expression.
- e. Mutation
- f. Recombinant DNA technology, PCR and gene therapy.

(12 hrs)

## **XX. Tissue Biochemistry**

- a. Heme metabolism: Outline of heme biosynthesis, degradation of heme and functions of normal hemoglobin
- b. Abnormal Hemoglobins
- c. Jaundice
- d. Porphyrias
- e. Plasma Proteins : Separation, functions and importance.
- f. Immunoglobulins : Structure and functions.
- g. pH of blood, its regulation, acidosis alkalosis, principles of estimation of body fluids, role of kidneys and lungs in blood pH maintenance.
- h. Water and electrolyte balance and disorders

## **XXI. Liver functions and Kidney functions**

(3 hrs)

- a. Liver function tests, kidney function tests.
- b. Detoxification mechanisms and Xenobiotics.

## **XXII. Nutrition and energy metabolisms**

(5 hrs)

- a. BMR and its importance
- b. Calorific value of food, RQ, SDA, balanced diet.
- c. Protein energy malnutrition, biological value of proteins, Nitrogen equilibrium and dietary fibres.
- d. Biochemistry of starvation.

## **XXIII. Biochemistry of Cancer**

(2 hrs)

- a. Oncogenes
- b. Growth factors
- c. Tumors markers
  - Definition
  - Clinically important tumours markers - CEA, Alfafetoprotein (AFB)
  - Human chorionic gonadotrophins (HCG), Calcitonin, Prostate Specific Antigen (PSA).

## **XXIV. Endocrine function:**

- a. Hormone actions : Mechanism of actions of insulin, glucagons, Epinephrine, steroids
- b. Thyroid function tests

{ (3 hrs)

## **XXV. Biochemical tests for Atherosclerosis and Myocardial Infarction**

- a. Lipid profiles, opoproteins, homocystiene and C-reactive protein
- b. CKMB, Troponin.

## **XXVIII. SI Units, Quality control and standardization**

(1 hr.)

- a. Clinical Chemistry - interpretation and reference values of Blood glucose, Urea, Creatinine, Uric Acid, Cholesterol, Calcium, Proteins, Albumin & A/G ratio.
- b. Instrumentation including autoanalyser

## **XXIX. Bio-medical Waste : Types, potential risks and their safe management.**

## **Practicals**

### **Part I**

#### **a. Practicals to be performed by students**

1. Reactions of Monosaccharides - Glucose and Fructose
2. Reactions of Disaccharides - Lactose, Maltose, Sucrose
3. Reactions of Polysaccharides - Starch
4. Identification of unknown carbohydrates
5. Precipitation and coagulation reactions of proteins.
6. Colour reactions of proteins : Albumin and casein
7. Identification of unknown proteins.
8. Identification of substances of physiological importance.
9. Normal constituents of urine
  - i. Organic : Urea, Uric Acid and Creatinine
  - ii. Inorganic : Ca, P, Cl, SO<sub>4</sub> and NH<sub>3</sub>
10. Analysis of abnormal urine
11. Spectroscopic examination of Hemoglobin derivatives and preparation of hemin crystals.
12. Spot test for PKU, Alkaptonuria and Homocystinuria.
13. Spotters.

### **Part - II**

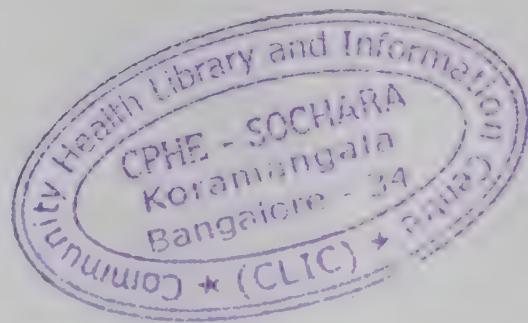
1. Estimation of blood glucose
2. Estimation of blood urea.
3. Estimation of serum inorganic phosphorus and interpretation.
4. Estimation of total serum proteins, serum albumin and A : G ratio.
5. Estimation of urinary creatinine and interpretation of creatinine clearance.
6. Interpretation of charts and case reports.

#### **b. Practicals for Demonstration only :**

1. Colorimetry
2. Chromatography
3. Paper electrophoresis
4. Glucose tolerance tests
5. Determination of AST (SGOT) and ALT (SGPT)
6. Estimation of serum cholesterol (Kit method)
7. Determination of ascorbic acid
8. Principle of flame photometry
9. Determination of glucose and proteins in CSF
10. Estimation of albumin in urine and test for Bence Jone's proteins in urine.

### **Teaching Hours**

1. Lectures	--	120 hours
Tutorials	--	20 hours
2. Practicals / Demonstration	--	80 hours
3. Seminars / Monthly tests, Internal assessment & Revision classes	--	20 hours



MP-100  
15160 P04

## Scheme of Examination

### Internal Assessment for Biochemistry

Total Marks : 40 (Theory : 30 and Practical : 10)

#### Theory and Records:

Minimum of three examinations are recommended. The examination preceding the University examination shall be similar to the University examination. The total marks shall be 30. Average marks secured out of best of two notified internal examinations shall be reduced to 30 sent to the University.

#### Practicals : 10 Marks

A minimum of two terminal practical tests is to be conducted. One at the end of each term. Average of the two tests should be reduced to 10 marks and shall be sent to the University.

#### University examination

##### A. Theory : 100 Marks

There shall be two papers. The total marks will be 100, with each paper carrying 50 marks. The total duration of both papers would be 3 hours. There shall be three types of questions. The distribution of topics and weightage of marks in Biochemistry for University examination is as under \*:

Type of question and distribution of marks in each paper

		PAPER I			PAPER II		
Type of Questions	Number of questions	Marks for each question	Total	Number of questions	Marks for each question	Total	
Long Essay	1	10	10	1	10	10	
Short Essay	5	5	25	5	5	25	
Short Answer	5	3	15	5	3	15	
TOTAL MARKS			50	TOTAL MARKS			50

Distribution of topics for each paper and weightage of marks in university examination

##### Paper I

		Weightage of marks
1.	Cell structure and function, sub cellular organelles, cell membranes, transport across the membranes.	5
2.	Chemistry, digestion, absorption and metabolism of Carbohydrates	10

3.	Chemistry, digestion, absorption and metabolism of lipids	10
4.	Amino acids and protein chemistry, general reactions of amino acids, digestion and absorption, urea cycle and metabolism of amino acids	10
5.	Vitamins	5
6.	Minerals	5
7.	Endocrine functions and Biochemical tests	5
8.	Detoxification and Xenobiotics	5
9.	Enzymes, Biological oxidation, integration of metabolism, TCA cycle and regulation of metabolism	10

## Paper II

		Weightage of marks
1.	Nucleotides and nucleic acid chemistry	5
2.	Purine and pyrimidine metabolism, DNA metabolism, RNA metabolism, Protein Biosynthesis	10
3.	Molecular genetics, regulation of gene expression, recombinant DNA technology, PCR and gene therapy	5
4.	Electrolyte and water balance, acid base balance	10
5.	Nutrition and energy metabolism	10
6.	Haem metabolism, normal and abnormal haemoglobins, Plasma proteins and immunoglobulins	10
7.	Free radicals and antioxidants, biochemistry of ageing.	5
8.	Bochemistry of cancer, Oncogenes and tumour markers	5
9.	Liver function tests	5
10.	Kidney function tests	5
11.	Clinical chemistry, quality control, interpretation and reference values and analysis	5

### Note:

- a. Weightage of marks assigned to chapters/topics may add to more than 50.
- b. Long essay questions may be asked from topics with weightage of 10 marks.
- c. Short Essay and short answer questions may be asked from any of the topics.

\* The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

## B. Practical Examination : 40 Marks

The Practical examination consists of two exercises, Practical I and II, each of two hours duration and each exercise carrying 20 marks.

### **Exercise I - One hour, 20 marks**

1. Quantitative estimation - Every candidate shall perform one given procedure.
  - a. Principle and procedure for the estimation asked in the question should be written by the candidate in the first five minutes - 5 marks
  - b. After collecting the papers, correct procedure for the estimation is given and practical examination is done. Total marks would be 15 and the distribution of marks would be:
    - (i) results (values)
    - (ii) calculations and reporting
    - (iii) for interpretation of results and application of the estimation}
  - c. Case studies, Graphs and Charts - Discussion 1x5 = 5 marks

### **Exercise II -One hour, 20 marks**

2. Qualitative analysis - Every candidate shall perform one given procedure such as Identification of Carbohydrates, Proteins, substance of Physiological importance, Analysis of Normal Urine, Analysis of abnormal Urine. Total Marks would be 30 and Distributions of marks would be:
  - for selection of appropriate reactions - 5 marks
  - for reasoning of analysis and correct reporting - 5 marks
  - for interpretation of results and application of the estimation - 5 marks
3. Five Spotters Biochemical Techniques - Chromatography, Electrophoresis, Osazone preparation, Biochemical Tests and Reagents 1x5 = 5 marks

### **C. Viva Voce Examination : 20 Marks**

The viva voce examination shall carry 20 marks and all the examiners will conduct the viva examination.

### **Recommended Text Books and Reference Books**

#### **Text Books**

1. MURRAY (ROBERT. KK), Harper's Biochemistry Ed. 26, Prentice Hall. 2003 p 925 Rs. 650/-
2. RAMAKRISHNA (S), PRASANNA (KG), RAJAN (R), 3rd edition - 2001 Text Book of Medical Biochemistry, Ed 3, Orient Longman, Bombay 2001, p717, Rs. 450/-
3. VASUDEVAN (DM) and SREE KUMARI (S), Text Book of Biochemistry for Medical students, Ed 3, Jay Pee Brothers, New Delhi, 2003, p637, Rs. 350/-
4. DAS (Debjyothi) Fundamentals of Biochemistry, Ed. 11, Academic Publishers, Calcutta, 2002 p848, Rs. 350/-

5. DR. DINESH PURI - Text Book of Biochemistry - A clinically oriented approach - BI Churchill Living Stone, New Delhi, 2002, Rs. 325/-

### **Reference Books**

1. LEHININGER (Albert) et al., Principles of Biochemistry, Ed. 3, LBS Publishers, Delhi, 2002, p 1143, £ 16.99.
2. ORTEN (James M) and NEUHAUS (OTTO.W), Human biochemistry, Ed. 9, Mosby, St. Louis, 1975, p 994
3. STRAYER (Lubert), Biochemistry, Ed. 5, WH Freeman & Co., Ny. 2002, p 1064, £ 38.99
4. DELVIN (Thomas M), Biochemistry with Clinical Correlation, Ed. 5, Willey Libs, NY 2002, p 1186, \$ 45/-
5. MONTGOMERY (REX) et. al., Biochemistry : A Case Oriented Approach, Ed 6, C V Mosby, St. Louis, 1996, p 905, \$ 66.95.

# PATHOLOGY

## **Goals and Objectives :**

MBBS Student at the end of training in Pathology will be able to :

- Understand the concepts of cell injury and changes produced thereby in different tissues and organs and the body's capacity for healing.
- Understand the normal homeostatic mechanisms, the derangement of these mechanisms and the effects on human systems.
- Understand the etiopathogenesis, the pathological effects and clinico-pathological correlation of common infectious and non-infectious diseases.
- Understand the concept of neoplasia with reference to the etiology, gross, and microscopic features, diagnosis and prognosis in different tissues and organs of the body.
- Correlate normal and altered morphology (Gross and Microscopic) of different organ systems in different diseases to the extent needed for understanding of disease processes and their clinical significance.
- Have knowledge of common immunological disorders and their resultant effects on the human body. Have an understanding of the common haematological disorders and the investigations necessary to diagnose them and determine their prognosis.
- Know the principles of collection, handling and dispatch of clinical samples from patients in a proper manner.
- Perform and interpret in a proper manner the basic clinical pathology procedures.
- Understand different types of Bio-medical waste, their potential risks and their management.

## **COURSE CONTENTS**

### **THEORY**

#### **GENERAL PATHOLOGY**

##### **1. INTRODUCTION**

Introduction and scope of Pathology  
Brief resume of Historical Aspects, present state of the art and future.  
Ethical aspects of Pathology practice.

## **II CELL INJURY**

Must know

1. Cell injuries : Aetiology and Pathogenesis with a brief recall of important aspects of normal cell structure.
2. Reversible cell injury : Types, Sequential changes, Cellular swellings, vacuolation, Hyaline changes, Mucoid changes.
3. Irreversible cell injury : Types of Necrosis & Gangrene, Autolysis.
4. Pathologic calcification : Dystrophic and Metastatic.
5. Intracellular Accumulations - Fatty changes, Protein Accumulations, Glycogen Accumulations, Pigments - Melanin/Hemosiderin.
6. Extra cellular accumulations : Amyloidosis - Classification, Pathogenesis, Pathology including special stains.

Desirable to know

Apoptosis, Ochronosis, Porphyria, Lipofuscin Pigment

## **III INFLAMMATION AND REPAIR**

Must know

1. Acute inflammation : features, causes, vascular and cellular events.
2. Morphologic variants of acute inflammation.
3. Inflammatory cells and Mediators.
4. Chronic inflammation : Causes, Types, Classification nonspecific & granulomatous with examples.
5. Repair, Wound healing by primary and secondary union, factors promoting & delaying the process.
6. Healing a specific site including bone healing.

## **IV IMMUNOPATHOLOGY**

Must know

1. Immune system : General concepts.
2. Hypersensitivity : type and examples, antibody and cell mediated tissue injury with examples.
3. Secondary immunodeficiency including HIV infection.

4. Auto-immune disorders : Basic concepts and classification, SLE.
5. AIDS-Aetiology, Modes of transmission, Diagnostic procedures, handling of infected material and health education.

#### **Desirable to know**

1. Primary immunodeficiency.
2. Autoimmune diseases : organ specific and non-organ specific such as polyarteritis nodosa, Hashimoto's disease, Sjogren's, Polymyositis, Dermato-Myositis, Scleroderma.
3. Organ transplantation : immunologic basis of rejection and graft versus host reaction

### **V INFECTIOUS DISEASES**

Must know

1. Mycobacterial diseases : Tuberculosis, Leprosy and Syphilis.
2. Bacterial disease : Pyogenic, Diphtheria, Gram negative infection, Bacillary dysentery.
3. Viral diseases : Poliomyelitis, Herpes, Rabies, Measles, Rickettsia, Chlamydial infection, HIV infection.
4. Fungal disease and opportunistic infections.
5. Parasitic diseases : Malaria, Filaria, Amoebiasis, Kala-azar, Cysticercosis, Hydrated cyst.

### **VI CIRCULATORY DISTURBANCES**

Must know

1. Hyperemia/Ischemia and Haemorrhage
2. Edema : Pathogenesis and types.
3. Chronic venous congestion : Lung, Liver, Spleen, Systemic
4. Thrombosis and Embolism : Formation, Fate and Effects.
5. Infarction : Types, Common sites, Gangrene.
6. Shock : Pathogenesis, types, morphologic changes.

### **VII GROWTH DISTURBANCES AND NEOPLASIA**

Must know

1. Atrophy, Hypertrophy, Hyperplasia, Aplasia, Hypoplasia, Metaplasia, Malformation, agenesis, dysplasia.
2. Precancerous lesions.
3. Neoplasia : classification, Histogenesis, Biological behaviour : Benign and Malignant, carcinoma and Sarcoma.
4. Malignant Neoplasia : Grades and Stages, Local & Distant spread.
5. Carcinogenesis : Environmental carcinogens, chemical, viral, occupational. Heredity and cellular oncogenes and prevention of cancer.
6. Benign & Malignant epithelial tumours Eg. Squamous papilloma, Squamous cell carcinoma, Malignant melanoma. Benign & Malignant mesenchymal tumours Eg: Fibroma, Lipoma, Neurofibroma, Fibrosarcoma, Liposarcoma, Rhabdo-myosarcoma, Teratoma.
7. Diagnostic Methods - Biopsy, Exfoliative Cytology, FNAC, Cryostat.
8. Tumour and host interactions : Systemic effects including paraneoplastic syndromes, tuour immunology.

Desirable to know

Detailed Procedures of Laboratory diagnosis, Cytology, Biopsy, Tumour markers, flow cytometry (basic concepts) PCR

## **VIII NUTRITIONAL & OTHER DISORDERS**

Must know

1. Protein energy malnutrition : Marasmus, Kwashiorkor, and Vitamin deficiency disorders, classification with specific examples.
2. Disorders of pigment and mineral metabolism such as bilirubin.
3. Exogenous pigments.

Desirable to know

Environmental Pathology

## **IX GENETIC DISORDERS**

Must know

Basic concepts of genetic disorders and some common examples and congenital malformation.

Desirable to know

Specific Diseases - Down's syndrome, Turner's syndrome, klinefelter's Syndrome, Storage Disorders.

## **SYSTEMIC PATHOLOGY**

### **X HAEMATOLOGY**

Must know

1. Constituents of blood and bone marrow, Regulation of hematopoiesis.
2. Anemia : Classification and clinical features & lab diagnosis.
3. Nutritional anemias : Iron deficiency anemia, Folic acid Vit. B 12 deficiency anemia including pernicious anemia.
4. Hemolytic Anaemias : Classification and Investigations.
  - a. Hereditary hemolytic anaemias : Thalessemia, Sickle cell anemia, Spherocytosis and Enzyme deficiencies.
  - b. Acquired hemolytic anaemias
    - i. Alloimmune, Autoimmune
    - ii. Drug induced, Microangiopathic
5. Pancytopenia - Aplastic anemia.
6. Hemostatic disorders, Vascular and Platelet disorders & lab diagnosis.
7. Coagulopathies - (i) Inherited (ii) Acquired with lab diagnosis.
8. Leukocytic disorders : Leukocytosis, Leukopenis, Leukemoid reaction.
9. Leukemia : Classification, clinical manifestation, pathology and Diagnosis.
10. Multiple myeloma and disproteinemias.
11. Blood transfusion ; Grouping and cross matching, untoward reactions transmissible infections including HIV & hepatitis, Blood-components & plasma-pheresis.

Desirable to know

1. Myelodysplastic syndrome - Basic concepts.
2. Myeloproliferative disorders : polycythemia, myelofibrosis - basic concepts.

### **XI CARDIOVASCULAR PATHOLOGY**

Must know

1. Congenital Heart disease : Atrial septal defect, Ventricular septal defect, Fallot's tetralogy, Patent ductus arteriosus.

2. Endocarditis.
3. Rheumatic Heart disease.
4. Vascular diseases : Atherosclerosis, monckeberg's medial calcification, Aneurysm and Arteritis and tumours of Blood vessels.
5. Ischemic heart Disease : Myocardial infarction.
6. Hypertension and hypertensive heart Disease.

Desirable to know

1. Cardiomyopathy - basic concepts
2. Tumours of Heart

### **XIII PATHOLGY OF KIDNEY & URINARY TRACT**

Must know

1. Glomerular diseases - nephritic & nephrotic, nephrotic syndrome
2. Tubulo interstitial diseases : Acute tubular necrosis & pyelonephritis.
3. Renal vascular disorders, kidney changes in hypertension
4. Renal tumours : Renal cell carcinoma, nephroblastoma.
5. Urolithiasis and Obstructive Uropathy, Hydronephrosis.
6. Ureteric lesion : Inflammatory lesions and tumours.
7. Urinary bladder inflammatory lesions and tumours.

Desirable to know

1. Renal malformations : polycystic kidneys, types and clinical features.

### **XIV PATHOLOGY OF THE ALIMENTARY TRACT**

Must know

1. Oral Pathology : Ulcers, leukoplakia : Ulcers, leukoplakis : Carcinoma oral cavity, diseases and Tumour of salivary gland & Esophagus and precancerous lesions, esophagus inflammatory functional disorders and tumours.
2. Stomach : Gastritis, Ulcer & Tumours.
3. Inflammatory diseases of small intestine : Typhoid, Tuberculosis, Crohn's and Malabsorption syndromes.

4. Inflammatory diseases of large intestine : Amoebic colitis, Bacillary dysentery ulcerative colitis, appendicitis, mesenteric, thrombosis, enterocolitis, diverticulosis & Hirschsprung diseases.
5. Tumours and tumour like condition of the small and large Intestine : Polyps, carcinoid, carcinoma, Lymphoma.
6. Pancreatitis and pancreatic tumours : i) Exocrine, ii) Endocrine
7. Salivary gland tumours : Mixed, Warthin's

Desirable to know

Apudomas, Intussusception

## XV HEPATO-BILIARY PATHOLOGY

Must know

1. Jaundice : Types, aetio-pathogenesis and diagnosis.
2. Hepatitis : Acute, Chronic, neonatal.
3. Alcoholic liver disease
4. Cirrhosis : Postnecrotic, Alcoholic, Metabolic and Portal hypertension
5. Liver abscesses ; Pyogenic, parasitic and Amoebic.
6. Tumours of Liver
7. Diseases of the gall bladder : Cholecystitis, Cholelithiasis, Carcinoma.

## XVI LYMPHORETICULAR SYSTEM / SPLEEN

Must know

1. Lymphadenitis - Non specific and granulomatous
2. Causes of Lymph Node enlargements. Reactive Hyperplasia, Primary Tumours - Hodgkin's and Non Hodgkin's Lymphomas, Metastatic Tumours.
3. Causes of Splenic Enlargements.

Desirable to Know

1. Thymus : Thymoma.

## XVII REPRODUCTIVE SYSTEM (MALE & FEMALE)

Must know

1. Diseases of Vulva - Bartholin's cyst, Condyloma accuminata and tumours.
2. Diseases of cervix : cervicitis and cervical carcinoma.
3. Diseases of uterus : Normal, hormonal changes in the endometrium, endometritis, endometrial hyperplasia and carcinoma, adenomyosis, smooth muscle tumours, Endometriosis, Classification.
4. Trophoblastic disease : Hydatidiform mole, Choriocarcinoma and laboratory diagnosis.
5. Diseases of ovary and Fallopian tubes : Endometriosis and tumours.
6. Prostate : Nodular hyperplasia and carcinoma.
7. Inflammatory lesions and tumours of testis.
8. Diseases of penis - inflammatory, premalignant and tumours.

Desirable to know

Basic of Pathology of Infertility

## XVIII DISEASES OF BREAST

Disease of the breast : Mastitis, abscess, fibrocystic disease, Neoplastic lesions, Fibroadenoma, duct papilloma, carcinoma, Phylloides tumour, Gynaecomastia.

## XIX MUSCULOSKELETAL SYSTEM

Must know

1. Osteomyelitis, acute, chronic, tuberculous, mycetoma
2. Metabolic diseases : Rickets/Osteomalacia, osteoporosis, Hyperparathyroidism Paget's disease.
3. Tumours Classification : Benign, Malignant, Metastatic and synovial sarcoma.
4. Arthritis : Suppurative, Rheumatoid, Osteoarthritis, Gout, Tuberculous.

## XX ENDOCRINE PATHOLOGY

Must know

1. Diabetes Mellitus : Types, Pathogenesis, Pathology, Laboratory diagnosis
2. Non-neoplastic lesions of Thyroid : Iodine deficiency goiter, autoimmune Thyroiditis, Thyrotoxicosis, myxedema, Hashimoto thyroiditis.
3. Tumours of Thyroid : Adenoma, Carcinoma : Papillary, Follicular, Medullary, Anaplastic.

4. Adrenal diseases : cortical hyperplasia, strophy, tuberculosis, tumours of cortex and medulla.  
Desirable to know

Parathyroid hyperplasia and Tumours, Pituitary Tumours.

## **XXI NEUROPATHOLOGY**

Must know

1. Inflammations and Infections : TB Meningitis, Pyogenic Meningitis, Viral meningitis and Brain Abscess.
2. Tuberculosis, Cysticercosis.
3. CNS Tumours : Astrocytoma, Neuroblastoma, Meningioma, medulloblastoma.

Desirable to know: Alzheimer's disease, Parkinsonism.

## **XXII DERMATO PATHOLOGY**

Must know

Skin Tumours: Squamous cell carcinoma, Basal cell carcinoma, Melanoma.

Desirable to know

Various Dermatitis/Dermatoses, Leprosy, Venereal lesions-syphilis, superficial fungal infections.

Dermal and appendage tumours.

## **XXIII OCULAR PATHOLOGY**

Must Know: Inflammations and infections of Conjunctiva, Lachrymal Glands.

Desirable to know: Retinoblastoma.

## **XXIV Bio-medical Waste:**

Types, potential risks and their safe management.

## **PRACTICALS**

I	Haematology	-	HAEMOGLOBIN Indices, PCV, ESR, Peripheral Blood Smear, Blood Grouping. Anaemias, leukemias, Hematology Charts.
II	Clinical Pathology	-	Urine Examination, Charts for discussion & Interpretation.
III	Histopathology	-	Minimum number of slides to be shown.
	1. Acute Inflammation	-2	
	2. Chronic inflammation	-6	
	3. Intracellular Accumulation	-4	
	4. Circulatory Disturbances	-4	
	Chronic Venous Congestion	-Spleen	
	Chronic Venous Congestion	-Liver	

Chronic Venous Congestion - Lung  
Organization of thrombus

5. Neoplasia -
- |                               |     |
|-------------------------------|-----|
| Benign epithelial tumour      | - 2 |
| Malignant epithelial tumours  | - 3 |
| Benign mesenchymal tumours    | - 4 |
| Malignant Mesenchymal tumours | - 2 |
6. Systemic pathology
- |                                 |      |
|---------------------------------|------|
| CVS - Atherosclerosis           | - 3  |
| Monckerberg's                   |      |
| Myocardial Infarction           |      |
| Rheumatic Heart Disease         |      |
| Respiratory system :            | - 4  |
| Renal system                    | - 3  |
| GIT -                           | - 4  |
| Liver                           | - 2  |
| Reproductive system and breast  | - 10 |
| Lymph nodes                     | - 3  |
| Endocrine System                | - 4  |
| Musculoskeletal system          | - 4  |
| CNS & peripheral nervous System | - 4  |

Corresponding specimens to be included for demonstration

For Examination - A minimum of 40 histopathology slides and 50 specimens should be available for spotters, discussion and viva-voce.

**c. TEACHING HOURS**

**Theory:**

**Total 120 Hrs.**

**i) GENERAL PATHOLOGY** 30 Hrs

**THE HISTORY AND SCOPE OF PATHOLOGY**

1. The History and Scope of Pathology
2. Cell injury
3. a) Inflammation and repair  
b) Chronic inflammation  
c) Wound healing
4. Immunopathology
5. Circulatory disturbances
6. Infectious diseases
7. Growth disturbances and neoplasia
8. Nutritional disorders
9. Genetic disorders

- ii) CLINICAL PATHOLOGY INCLUDING CLINICAL HAEMATOLOGY** 10 Hrs
1. Sample collection of various haematological and clinical Pathological Investigation, Anti Coagulants.
  2. Theoretical aspects of Hb-estimation, Blood indices, ESR, L.E. Cell, Reticule cyte, normal Values in haematology.
  3. Study of Bone Marrow and Marrow transfusion.
  4. Blood Grouping : Concept of Blood Group, Selection of Donor, major and Minor Cross Matching. Blood Transfusion, reaction, diseases transmitted by blood transfusion and Comb's Test.
  5. CSF Analysis.
  6. Semen Analysis.
  7. Exfoliative cytology, FNAC and FNAB.
  8. Body fluids, Pleural, Peritoneal, Synovial, pericardial fluids.
  9. Liver Function Test, Renal Function Test and Thyroid Function Test.

**iii) SYSTEMATIC PATHOLOGY**

1. Haematology :	10 hrs
a) Clinical Hematology	4 hrs
2. Cardio Vascular System	8 hrs
3. Respiratory System	6 hrs
4. Renal System	8 hrs
5. Alimentary Tract	6 hrs
6. Hepato Biliary Pathology	6 hrs
7. Lymphoreticular System	4 hrs
8. Reproductive System	9 hrs
9. Osteo Pathology	6 hrs
10. Endocrine pathology	4 hrs
11. Neuropathology	2 hrs
12. Dermato Pathology	2 hrs
13. Ocular Pathology	1 hrs

**Practicals : 144 hrs.**

The students of Pathology are to be trained in Practical laboratory work including the basics in clinical Pathology, haematology and Histopathology including morbid anatomy.

1. The students should be conversant with the organization and functioning of the laboratories and should be aware of the safety precautions to be taken in the laboratories.

2. The students should be conversant with the use of compound microscope.
3. They should be conversant and be able to perform and interpret the routine laboratory investigations.
4. The students should be aware of the common methods of collection of samples for haematological and bio-chemical investigations and anticoagulants to be used. They should be conversant with the methods of collection of body fluids and for cytological examinations and the preservatives to be used.
5. The clinico-pathological exercises include the physical and chemical examinations of urine including the microscope and the application of the tests in diagnosis of diseases.
6. The haematology exercises include the Haemoglobin estimation, E.S.R. peripheral smears study, P.C.V. and cell counts (R.B.C., W.B.C., Eosinophil), and haematological indices, total and differential count, reticulocyte count, blood grouping, and techniques and interpretation of bone marrow preparations to be demonstrated.
7. The students should also be conversant with the method of collection and transportation of biopsy specimens to the laboratory including the preservatives used. They should have the knowledge of method of processing of samples and common histological techniques including H & E stain and a few special stains like PAS, Verhoff stains, Perl's Prussian stain MTS and Papanicolaou etc.,
8. The students should also have the knowledge of application of frozen section
9. The students should be able to identify as spotters the common histopathological, haematological and cytological slides and specimens and charts and their interpretations.
10. The students should be able to correlate the history and identify the common histopathological and haematological slides and specimens and discuss the relevant diagnosis.
11. The student should have the knowledge of rapid diagnostic methods and principle and use of Auto Analyzers.
12. The students should maintain the practical record book and keep it up-to-date and submit on time for valuation.

#### **Integrated teaching hours : 36 Hours**

#### **SCHEME OF EXAMINATION**

#### **INTERNAL ASSESSMENT**

It shall be based on evaluation of assignment, preparation of seminar, clinical presentation etc., (see Annex - I for example). Regular periodic examinations should be conducted throughout the course. Although the question of number of examinations is left to the institution, there should be a minimum of at least three (3) sessional examinations during Phase -II of the course and average of

best two examination marks should be taken into consideration while calculating the marks of the internal assessment. Day to day records should be given importance in the internal assessment.

Proper record of the work should be maintained, which will be the basis of all students' internal assessment and should be available for scrutiny.

### **Theory : 60 Marks**

Minimum of three examinations are recommended. The examination preceding the University examination will be similar to the University examination. The total marks would be 60. Average marks of best of two notified internal examinations should be reduced to 60 and should be sent to the University.

### **Practicals : 20 Marks**

A minimum of three practical tests is to be conducted, one at the end of each term. Five marks will be for records and 15 marks for terminal examinations. Average marks of the three terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and sum of the two shall be sent to the University.

## **UNIVERSITY EXAMINATION**

### **A. WRITTEN PAPER : 200 Marks**

There shall be two theory papers of 100 marks each and duration of each paper will be of 3 hours. The pattern of questions would be of three types.

Type of Questions	Number of questions	Marks for each questions	Total
Long Essay	2	10	20
Short Essay	10	5	50
Short Answer	10	3	30
<b>Total Marks</b>			<b>100</b>

The distribution of topics and weightage of marks for University examination is as under \*:

#### **\*Paper - I:**

#### **General Pathology including Clinical Pathology & Haematology Max : 100 marks**

The distribution of marks for different topics / chapters would be as follows :

- |                         |            |
|-------------------------|------------|
| 1. General Pathology    | - 50 marks |
| 2. Haematology          | - 20 marks |
| 3. Clinical Pathology   | - 15 marks |
| 4. Clinical Haematology | - 15 marks |

\* Paper - II Systemic Pathology

**Max : 100 marks**

- |                                                                                                    |   |          |
|----------------------------------------------------------------------------------------------------|---|----------|
| 1. Cardiovascular System                                                                           | } | 20 marks |
| 2. Respiratory System                                                                              |   |          |
| 3. Alimentary System including diseases of liver, Gall bladder & Exocrine Pancreas.                | } | 20 marks |
| 4. Endocrine system - Disease of Thyroid, Adrenals, Parathyroid, Pituitary and Endocrine pancreas. |   |          |
| 5. Lymphoreticular system                                                                          |   |          |
| 6. Urinary System                                                                                  | } | 20 marks |
| 7. Male Genital system                                                                             |   |          |
| 8. Female Genital system                                                                           |   |          |
| 9. Breast                                                                                          |   |          |
| 10. Musculoskeletal system                                                                         | } | 20 marks |
| 11. Nervous system                                                                                 |   |          |
| 12. Skin                                                                                           |   |          |
| 13. Ocular pathology                                                                               |   |          |

\* Note: The distribution of topics and marks are suggestive. Some overlapping is inevitable. The students are expected to study and answer overlapping topics.

**B. PRACTICAL EXAMINATION : 80 Marks**

- |                                                                               |          |
|-------------------------------------------------------------------------------|----------|
| 1. Spotters.<br>(Including slides, specimens, instruments & charts)           | 20 marks |
| 2. Urine examination with clinical history and findings and interpretations   | 15 marks |
| 3. Stained smear given with clinical history for reporting and interpretation | 15 marks |
| 4. Chart : Clinical Pathology, Haematology and Cytology with interpretation.  | 10 marks |
| 5. Haematology estimation / Blood grouping with clinical distology            | 10 marks |
| 6. Histopathology slide discussion with reporting and clinical history        | 10 marks |
- TOTAL  
80 marks

**C. VIVA - VOCE EXAMINATION : 40 Marks**

The oral examination shall carry 60 marks and all the examiners will conduct the oral examination.

- |                       |          |
|-----------------------|----------|
| 1. General pathology  | 10 marks |
| 2. Clinical Pathology | 10 marks |
| 3. Systemic Pathology | 10 marks |

- (C.V.S., R.S., G.I.T.)

4. Systemic Pathology - II 10 marks  
(Renal system, Bones & Joints  
Male & Female reproductive System,  
Endocrinology, Skin & C.N.S.,  
Lymph node & Spleen)

A LIST OF HAEMATOLOGY SLIDES & INSTRUMENTS RECOMMENDED FOR SPOTTERS

### a) HAEMATOLOGY SLIDES (Minimum of 10 slides)

1. Microcytic Hypochromic anemia
  2. Macrocytic anemia
  3. Dimorphic anemia.
  4. Haemolytic anaemia.
  5. Normocytic Hypochromic Anemia
  6. Eosinophilia
  7. Reticulocytes
  8. Acute myeloblastic leukemia
  9. Chronic myeloid leukemia
  10. Acute lymphoblastic leukemia
  11. Chronic lymphatic leukemia
  12. Multiple myeloma - Bone marrow
  13. Microfilaria
  14. Malaria parasite

**b. INSTRUMENTS (Minimum ten)**

1. Lumbar puncture needle
  2. Liver biopsy needle
  3. Bone marrow aspiration needle
  4. Wintrob's Tube with stand
  5. Westergren's E.S.R. Tube and Stand
  6. Urinometer
  7. R.B.C. Pipette
  8. W.B.C. Pipette
  9. Sahli's Haemoglobinometer
  10. Sahli's Haemoglobinometer central diluting tube.
  11. Sahli's Haemoglobinimeter pipette.
  12. Albuminometer
  13. Neubauer's Counting Chamber

**c. LIST OF HISTOPATHOLOGY SLIDES AND SPECIMEN**

- ## 1. Acute Appendicitis

2. Lobar Pneumonia
3. T.B. Lung
4. T.B. Lymphnode
5. Sequestrum
6. Fatty Liver
7. Fatty Heart
8. C.V.C. Liver
9. Lipoma
10. Squamous cell carcinoma Foot
11. Malignant Melanoma
12. Cavernous Haemangioma Liver
13. Chondroma
14. Madura Mycosis
15. Gastric Ulcer
16. Adenocarcinoma Colon
17. T.B. Intestine
18. Polyp-Intestine
19. Typhoid Ulcer - Intestine
20. Intusseception
21. Amoebic Ulcer-Intestine
22. Bacillary Dysentery
23. Gall Stones
24. Portal Cirrhosis
25. Bronchiectasis
26. Emphysema
27. Secondaries Lung
28. Bronchogenic Carcinoma
29. Rheumatic Endocarditis
30. Rheumatic Pericarditis
31. Mitral & Aortic Stenosis
32. Atheroma Aorta
33. Chronic Glomerulonephritis
34. Hydronephrosis
35. Vesical Calculus
36. Wilm's Tumour
37. Carcinoma - Kidney
38. Carcinoma - Penis
39. Seminoma Testis
40. Mucinous Cyst adenoma
41. Dermoid Cyst - Ovary
42. Leiomyoma Uterus
43. Hydatidiform Mole
44. Osteoclastoma
45. Osteo Sarcoma
46. Fibro adenoma Breast
47. Carcinoma Breast

48. Multinodular Goitre
49. Micro nodular and macro nodular cirrhosis
50. Meningitis
51. Amoebic liver abscess
52. Gangrene foot/hand
53. Infarction - heart
54. Infarction - spleen
55. Infarction - lung
56. Carcinoma of cervix.
57. Carcinoma of stomach.
58. Chronic pyelonephritis.
59. Amyloid spleen.

**d. RECOMMENDED BOOKS:**

1. ROBBINS (Stanley L) Et. AL, Pathologic Basis of Diseases. Ed 6. Prism Books Pvt. Ltd., Bangalore.
2. MOHAN (Harsh), Textbook of Pathology, Edn 4, Jaypee Brothers, New Delhi.
3. FIRKIN (Frank) et al, de Gruchy's Clinical Haematology in Medical practice Ed 5. Oxford University Press, Delhi 1989, P 524, Rs. 475.
4. FIRKIN (Frank) et al, de Gruchy's Clinical Haematology in Medical practice Ed 5. Oxford University Press, Delhi 1989, P 524, Rs. 475.
5. WALTER (JB) and Israel (MS), General Pathology, Ed. 7, Churchill Livingstone, Edinburgh, 1996. P- 952, £ 25.
6. Govan (Alasdair) Et al., Pathology, Illustrate, Ed. 4, Churchill Livingstone, Edinburgh, P-843, £ 10.95.
7. SOOD (Ramnik) Medical Laboratory Technology, Ed. 4, Jaypee Brothers, New Delhi, 1996, P - 740, Rs. 200/-.

**REFERENCE BOOKS**

**LEVEL - 1**

1. Mc Gee (Jaures) Et al., Oxford Textbook of Pathology, Ed I, Vol. I 2a and 2b, Oxford University Press, Oxford, 1992, P-2344.
2. KISSANE (John) Anderson's Pathology, Ed-10, Vol. I & II, The CV Mosby Company, St. Louis, 1996, P 2905. Rs. 2000/-
3. CURRAN (RC), Colour Atlas of Histopathology, Ed - 3, Harvey Miller Publishers, Oxford University Press, New York, 1985. P-292, Rs. 1295/-.

4. MOIC SWEEN (Roddie) and Whaley (Keith), Muir's Text Book of Pathology, Ed-13, ELBS 1992, P-1245, £9.5.
5. DACIE (Sir John) and LEWIS (SM), Practical Haematology, Ed.7, Churchill Livingstone, London 1991, P-556, £10.5.
6. RUBIN (Emanuel) and FABER (John). Pathology, Ed.1, J.B.Lippincott Company, Philadelphia, 1988, P-1576, \$ 75.

### **LEVEL -2**

1. SYMMERS (WSTC), Systemic Pathology, Ed-3, Vol. 1-16. Churchill Livingstone, Edinburgh 1995.
2. JONES (Howond) and JONES (Geogeanna), Novak's Text book of Gynecology, Ed 10. Williams and Wilkins, 1981. P-871, \$47.50.

### **LEVEL -3**

1. ROSAI (Juan), Ackermann's Surgical Pathology, Ed 10, the C.V. Mosby Company, St.Lois, 1996, P-2732, Rs. 2000/-.
2. RAPHAEL (Stanley), Lynch's Medical Laboratory Technology, Ed-4, WB Saundar's Company, London 1983, P-845.
3. LEE (Richard) Et al, Wintrobe's Clinical Hematology, Ed-10, vol. 1&2, Williams and Wilkins 1998, P-2680, \$179.00.
4. HENRY (John) : Clinical Diagnosis and Management by Laboratory Method, Ed-19, WB Saundar's Company, London. A Prism Indian Edition, 1996, P-155 Rs. 700/- (Jaypee).

**\* Specification mentioned such as edition, number of pages, cost etc., subject to change with newer edition.**

# MICROBIOLOGY

## GOALS AND OBJECTIVES

A MBBS student at the end of the microbiology course will be able to :

1. Describe the mechanisms of host parasite relationship
2. List the normal flora of the human body.
3. Describe the etiology and pathogenesis of common infections diseases.
4. List the microbes that cause opportunistic infections in humans and describe their pathogenesis.
  - a. Choose appropriate laboratory investigations required for a clinical diagnosis.
  - b. Sample the right specimen, at the right time, by the right method.
  - c. Analyze and interpret the results of laboratory tests.
  - d. Perform some simple tests, which help to arrive at rapid diagnosis.
5. Apply the principles of immunology in the pathogenesis, diagnosis and prevention of infectious and non-infectious diseases.
6. Practice the techniques of asepsis, antisepsis and sterilization in day-to-day procedures and apply universal precautions in laboratory and clinical practice.
7. Organize the prevention and control of communicable diseases in the community or hospital.
8. Understand the ecology (microbial) of specialized areas like hospital, water, food and prevent the possible spread of infections.

## OBJECTIVES

MBBS student at the end of Microbiology Courses will be able to :

- Describe the etiology and Pathogenesis of common infectious diseases.
- Describe the mechanisms of host-parasite relationship.
- Investigate common infectious diseases with particular emphasis to appropriate methods of specimen collection and laboratory diagnosis and proper interpretation of laboratory test results.
- Be aware of salient features of uncommon infectious diseases.
- Apply the principles of immunology in the pathogenesis, diagnosis and prevention of infectious and non-infectious diseases.
- Practice laboratory guided antimicrobial therapy
- Practice the techniques of asepsis, antisepsis and sterilization in day to day procedures and apply universal precautions in laboratory and clinical practice.
- Organize the prevention and control of communicable disease in the community or hospital.
- Understand different types of Bio-medical waste, their potential risks and their management.

## **COURSE CONTENTS**

### **THEORY**

#### **I. INTRODUCTION**

Must know

1. Morbidity and mortality data of infectious diseases prevalent in the country with reference to the National Health Programmes and in the local geographic area.

Desirable to know

1. Significant milestones in the history of Microbiology

#### **II GENERAL MICROBIOLOGY**

Must know

1. Definitions : infections, parasite, host, vector, fomite, contagious disease infectious disease, epidemic, endemic, pandemic, Zoonosis, Epizootic, Attack rate.
2. Normal flora of the human body.
3. Routes of infection and spread; endogenous and exogenous infections; source at reservoir of infections.
4. Bacterial cell. Morphology limited to recognizing bacteria in clinical samples Shape, motility and arrangement. Structures, which are virulence, associated.  
Physiology : Essentials of bacterial growth requirements.
5. Sterilization, disinfection and universal precautions in relation to patient care and disease prevention. Definition of asepsis, sterilization, disinfection.
6. Antimicrobials : Mode of action, interpretation of susceptibility tests, resistance spectrum of activity.
7. Bacterial genetics.

#### **III IMMUNOLOGY**

Must know

1. Basic principles of immunity immunobiology : lymphoid organs and tissues.  
Antigen, antibody reactions with relevance to pathogenesis and serological diagnosis.
2. Humoral immunity and its role in immunity
3. Cell mediated immunity and its role in immunity.
4. Immunology of hypersensitivity,
5. Measuring immune functions.
6. Immunological basis of the autoimmune phenomena.
7. Immunodeficiency with relevance to opportunistic infections.
8. Basic principles of transplantation immunity
9. Basic principles of tumour immunity.

#### **SYSTEMATIC MICROBIOLOGY**

#### **IV BACTERIOLOGY**

To be considered under the following headings

Morphology, classification according to pathogenicity, mode of transmission, methods of prevention, collection and transport of samples for laboratory diagnosis, Interpretation of laboratory reports, Rapid bedside diagnosis where feasible, list of antimicrobial agents and control measures with special relevance to the National Control and Eradication programmes, in respect of

#### Must know

1. Staphylococci,
2. Streptococci and pneumococci,
3. Neisseriae,
4. Corynebacterium diphtheria,
5. Mycobacteria : Tuberculosis, M.leprae, atypical mycobacteria,
6. Enterobacteriaceae,
7. Parvobacteria : Haemophilus, Bordetella, Brucella, Pasteurella, Gardnerella,
8. Vibrios : V. cholerae and other medically important vibrios,
9. Campylobacters and Helicobacters,
10. Pseudomonas,
11. Bacillus anthracis,
12. Sporing and non-sporing anaerobes : Clostridia, Bacteroides and Fusobacteria,
13. Chlamydiae : Mycoplasma
14. Actionmycetales : Actinomycetes and Nocardia,
15. Spirochaetes,
16. Rickettsiae

#### Desirable to know

Listeria monocytogenes

## V GENERAL VIROLOGY

#### Must know

General properties : Basic structure and broad classification of viruses. Pathogenesis and pathology of viral infections. Immunity and prophylaxis of viral diseases. Principles of laboratory diagnosis of viral diseases. List of commonly used antiviral agents. Bacteriophage with relation to virulence mechanism and epidemiology.

#### Desirable to know

Replication and genetics.

## VI SYSTEMATIC VIROLOGY

#### Must know

1. Herpes viruses : List of viruses included, lesions produced, pathogenesis and latency principles and Laboratory diagnosis.
2. Arbo viruses : List of arboviruses prevalent in India, general properties, mode of transmission, disease syndromes produced, common diagnostic tests, prevention of spread.
3. Picoma viruses : Common infections produced, classification and general properties, pathogenesis of poliomyelitis, immunoprophylaxis of poliomyelitis.

4. Myxoviruses : General properties, classification according to diseases produced, antigenic variations in influenza virus with relevance to vaccine efficacy; measles, mumps and rubella; important features and prophylaxis.
5. Rabies virus : General properties; antirabies vaccine, antemortem diagnosis in rabies.
6. Hepatitis virus : List of viruses, pathogenesis, mode of infection, list of diagnostic tests and their interpretation, methods of prevention and control.
7. Human immunodeficiency virus : Structure with relevance to laboratory diagnosis and type of infection, laboratory tests and their interpretation, universal precautions, specific precautions, recent trends in diagnosis and prophylaxis.
8. Rota virus : laboratory diagnosis.
9. Adenovirus - Infections caused and Laboratory diagnosis.

Desirable to know

1. Slow virus infection.
2. Poxviruses.
3. Oncogenic viruses.

## VII MYCOLOGY

Must know

General properties of fungi. Classification based on disease: superficial, subcutaneous, deep mycoses opportunistic infections including Mycotoxins, systemic mycoses. General principles of fungal diagnosis, Rapid diagnosis. Method of collection of samples. Antifungal agents.

## VIII. PARASITOLOGY

1. Protozoans :
  - i) Intestinal,
  - ii) Genital,
  - iii) Protozoans in blood
  - iv) Opportunistic protozoans.
2. Helminths :Cestodes : Taenia, Echinococcus, Hymenolepis
3. Nematodes : Intestinal, Tissue
4. Medical entomology with reference to vectors.

Desirable to know

1. Trematodes of medical importance.

## IX CLINICAL/APPLIED MICROBIOLOGY

Must know

- 1) Streptococcal infections : Rheumatic fever and Rheumatic heart disease, 2) Meningitis, 3) Tuberculosis, 4) Enteric fever, 5) Dysentery, 6) Diarrhoeal diseases, 7) Pyrexia of unknown origin, 8) Eye-infections, 9) leprosy, 10) Sexually transmitted diseases, 11) Poliomyelitis, 12) Hepatitis, 13) Acute-respiratory infections, 14) Central nervous System infections, 15) Urinary tract infections, 16) Pelvic inflammatory disease, 17) Wound infection, 18) Opportunistic infections, 19) HIV infection, 20) Malaria, 21) Filariasis, 22) Zoonotic diseases.

(Integrated teaching suggested for the above topics)

Desirable to know

1) Bone and joint infections, 2) Food poisoning, 3) Exanthematous conditions. 4) Organisms used in bioterrorism.

## X. BIO-MEDICAL WASTE : Types, potential risks and their safe management.

### SKILLS

Must know

1. Do stool exam for ova and cysts; and hanging drop for vibrio for vibrio cholera.
2. Do and examine a wet film of vaginal smear for Trichomonas and fungus.
3. Perform and interpret Gram's stain, and Ziehl-Neelsen or modified Ziehl Neelsen's stain.
4. Perform skin scrapings and do a KOH preparation for fungal infection.
5. Do cell counts and gram stain of CSF and other body fluids.
6. Interpret blood smear for parasites like malaria and filaria.
7. Interpret antimicrobial sensitivity reports.
8. Interpret serological tests such as VDRL, ASLO, WIDAL, HIV, Rheumatoid factor, hepatitis and TORCH infections, Treponema pallidum Haemagglutination, Haemagglutination in Virology, Haemagglutination inhibition.
9. Be able to collect and transports following clinical samples for microbiological tests : Blood, pus, urine, CSF, body fluids, stool, sputum, throat swabs and serum.
10. Adopt universal precautions for self precaution against HIV and hepatitis.

### TEACHING HOURS

#### THEORY

No. of hours of teaching : 120 hrs.

1. Introduction To Microbiology and General Bacteriology :	10 hrs.
2. Immunology :	20 hrs.
3. Systematic Bacteriology :	35 hrs.
4. Virology :	20 hrs.
5. Mycology :	05 hrs.
6. Parasitology :	25 hrs.
7. Applied Microbiology :	05 hrs.

#### PRACTICAL

#### PRACTICAL EXERCISES IN MICROBIOLOGY

The students would perform the following procedures :

- i) Gram stain, ii) Ziehl Neelsen stain, iii) Modified Ziehl Neelsen stain, iv) Albert stain, v) Hanging drop vi) Wet mount for stool examination, vii) Iodine mount for stool examination, viii) Lactophenol cotton blue mount for fungus examination, ix) Simple stain

## I MICROSCOPE

- a) Principles and use of compound Microscope in detail
- b) Dark ground Microscope
- Fluorescent Microscope
- Phase Contrast Microscope
- Electron Microscope

## II STERILIZATION :-

- a) Principle, Uses and Demonstration of common sterilization equipment namely, Autoclave, Hot Air Oven, Serum Inspissator, Arnold Steriliser, Filters.

## III CULTURE MEDIA :

Classification of culture media, Principles, main ingredients and uses of common culture media. Namely-Peptone water, Nutrient Broth, Nutrient Agar, Blood Agar, Chocolate agar, Mac Conkey, Wilson Blair, TCBS, LJ, Potassium telluride, Dorset egg, Loeffler's serum slope, RCM, milk agar, Selenite F-broth, Blood culture broth. Media for Biochemical reaction - Sugar Fermentation, Urease, Citrate, Indole Media with growth of common organisms for demonstration namely Staphylococci, C. diphtheria, Mycobacterium tuberculosis, Salmonella on W.B., Vibrio on TCBS, Mac-Conkey with LF & NLF, Milk Agar with Staphylococci, Proteus on Nutrient Agar. Antibiotic sensitivity - methods & principles.

## IV STAINING AND HANGING DROP :

- 1) Demonstration of motility by hanging drops method.
- 2) Gram Stain
- 3) ZN Stain

## V PARASITOLOGY :

Examination of faeces for helminthic Eggs, (Round worm, hook Worm, Whip Worm, H. nana)

## VI APPLIED BACTERIOLOGY :

Demonstration of specimen collection.  
Growth on appropriate media  
Biochemical reactions.

Appropriate special tests for the lab-diagnosis of common infectious diseases. Namely :

- 1. Pyogenic Infection
- 2. Enteric Fever
- 3. Bacillary Dysentery
- 4. Cholera
- 5. U.T.I.
- 6. Infantile Diarrhoea
- 7. Tuberculosis

**VII DEMONSTRATION OF SEROLOGICAL TEST:** Widal Test, VDRL, ELISA.

**VIII DEMONSTRATION OF FUNGUS :** Growth, Slide mounts of common fungi, Candida, Aspergillus, Mucor, Rhizopus, Penicillium, Dermatophytes (one or two)

**IX USES OF LABORATORY ANIMALS :** Rabbit, Guinea Pig & Mouse

## **X DEMONSTRATION OF SLIDES & INSTRUMENTS**

## **XI MEDIA & SPECIMENS (DEMONSTRATION)**

The following procedures are only for demonstration. Students will interpret results, but need not perform the procedure of tests. Serological demonstration of - WIDAL, VDRL. Haemagglutination, Haemagglutination inhibition, Complement fixation test, Viral Haemagglutination, ELISA.

## **XII INTEGRATED TEACHING: 36 Hours**

1. Enteric fever
2. Cholera
3. HIV & AIDS
4. Tuberculosis
5. Hospital infection & Control Measures
6. Malaria

The following materials are to be procured for the conduct of practical classes.

### **i. SLIDES**

- |                                    |                              |
|------------------------------------|------------------------------|
| 1. Staphylococci                   | 2. Streptococci              |
| 3. Gonococci                       | 4. M. tuberculosis           |
| 5. M. Leprae                       | 6. C. diphtheriae            |
| 7. T. pallidum                     | 8. C. tetani                 |
| 9. Negative Staining (Pneumococci) | 10. Malarial Parasite        |
| 11. Microfilaria                   | 12. Cyclops                  |
| 13. Hydatid cyst wall              | 14. Negri Bodies             |
| 15. Molluscum contagiosum          | 16. Rhinosporidiosis         |
| 17. Candida                        | 18. Cryptococcus             |
| 19. Aspergillus                    | 20. Penicillium              |
| 21. Mucor/Rhizopus                 | 22. Pneumococci - Gram stain |
| 23. Y. pestis                      | 24. Mycetoma - H & E Stain   |
| 25. Cestode - Segment              |                              |

### **ii. MEDIA**

#### **1. Without Growth :**

Peptone Water, Nutrient broth; Nutrient agar, Blood agar, Chocolate agar, Mac-Conkey agar, Wilson & Blair medium, T.C.B.S., L.J. Medium, Robertson Cooked meat medium, Milk agar, Selenite F Broth, Blood culture Broth, Dorset egg medium & Loeffler's Serum Slope.

## **2. With Growth :**

1. Staphylococcus - albus, aureus on Nutrient agar
2. Staphylococcus - albus, aureus on milk agar
3. Potassium tellurite medium with C. diphtheria
4. L.J. with M. tuberculosis
5. Mac Conkey with LF & NLF
6. Wilson & Blair with growth
7. TCBS with growth
8. Proteus - on Nutrient agar or on Blood agar
9. Sugar fermentation - Indole - Negative & Positive
10. Urease - Negative & Positive
11. Citrate - Negative & Positive
12. Sabouraud's glucose agar with Candida / Aspergillus
13. Sabouraud's glucose agar with any Dermatophyte.

## **iii. LIST OF INSTRUMENTS**

- |                          |                       |
|--------------------------|-----------------------|
| 1. Seitz filter          | 6. Sterile swab       |
| 2. Candle filter         | 7. Tuberculin syringe |
| 3. Macintosh filde's jar | 8. Microtitre plate   |
| 4. VDRL slide            | 9. Inoculation loop   |
| 5. Widal rack with tubes | 10. Pasteur pipette   |

## **iv LIST OF SPECIMENS**

- |              |                    |
|--------------|--------------------|
| 1. Roundworm | 5. Hydatid cyst    |
| 2. Hookworm  | 6. Embryonated egg |
| 3. Whip worm | 7. Suckling mouse  |
| 4. Tapeworm  | 8. Guinea worm     |

## **v EXPERIMENTAL ANIMALS :**

1. Rabbit
2. Guinea pig.
3. Mouse

## **TERM WISE DISTRIBUTION OF THEORY PORTIONS**

**IV TERM :** GENERAL BACTERIOLOGY, IMMUNOLOGY & SYSTEMATIC BACTERIOLOGY (COCCI)

**V TERM :** REMAINING SYSTEMATIC BACTERIOLOGY & PROTOZOOLOGY

**VI TERM :** HELMINTHOLOGY, VIROLOGY, MYCOLOGY & APPLIED MICROBIOLOGY.

## **SCHEME OF EXAMINATION INTERNAL ASSESSMENT**

It shall be based on evaluation of assignment, preparation of seminar, clinical presentation etc., (see Annex-I for examples). Regular periodic examinations should be conducted throughout the course. Although the question of number of examinations is left to the institution, there should be a minimum of at least three (3) sessional examinations during Phase-II of the course and average of best two examination marks should be taken into consideration while calculating the marks of the internal assessment. Day to day records should be given importance in the internal assessment.

Proper record of the work should be maintained which will be the basis of all students' internal assessment and should be available for scrutiny.

### **THEORY : 60 Marks**

Minimum of three examinations are recommended. The examination preceding the University examination will be similar to the University examination. The total marks would be 60. Average marks of best of two notified internal examinations should be reduced to 60 and should be sent to the University.

### **PRACTICAL : 20 Marks**

A minimum of three practical tests is to be conducted one at the end of each term. Five marks will be for records and 15 marks for terminal examinations. Average marks of the best of the two of three terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and sum of the two shall be sent to the University.

### **UNIVERSITY EXAMINATION : A. WRITTEN PAPER : 200 Marks**

There shall be two theory papers of 100 marks each and duration of each paper will be of 3 hours. The pattern of questions would be of three types.

Type of Questions	Number of questions	Marks for each questions	Total
Long Essay	2	10	20
Short Essay	10	5	50
Short Answer	10	3	30
<b>Total Marks</b>			<b>100</b>

**The distribution of topics and weightage of marks for University examination is as under \*:  
Paper I: 100 Marks**

General Bacteriology	20 Marks
Immunology	30 Marks
Systemic Bacteriology	50 Marks

## **Paper II : 100 Marks**

Virology	40 Marks
Parasitology	40 Marks
Mycology	10 Marks
Applied Microbiology	10 Marks

\* The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

## **B. PRACTICAL EXAMINATION : 80 Marks**

It shall carry 80 marks. The distribution of marks for different components are :-

Spotters \*\* 10

Gram's Stain	- 15	
Special (ZN or Alb) Stain	- 15	
Parasitology (Stool Examn)	- 15	
Clinical Bacteriology	- 15	
Clinical Virology (Charts) or Clinical Mycology (Slide & Culture)	- 10	Clinical Microbiology can be kept together as charts or culture and slide

List of Spotters recommended and distribution of marks for each Spotter

<b>** Spotter</b>	<b>Marks</b>
Slides	2 + 2
Media	3
Instrument	1
Specimen	1
Animal	1
Total Marks	10

## **C. VIVA VOCE EXAMINATION : 40 Marks**

The Viva-Voce Examination shall carry 40 marks and all examiners will conduct the Viva-Voce.

### **Distribution of Topics & Marks**

General Bacteriology & Immunology	10 Marks
Systematic Bacteriology	10 Marks
Virology & Mycology	10 Marks
Parasitology	10 Marks

### **RECOMMENDED BOOKS (Recent Editions)**

1. Ananthanarayan : (Ananthanarayan and Jayaram Paniker's) Textbook of Microbiology, Et. & Orient Longman Ltd., Chennai.
2. Jawetz (Melnick) et al, Medical Microbiology, ed. Z Appleton and Lange, USA.

3. Zinsser (Joklik and Willett) et. Al, Microbiology, Appleton and Lange, USA.
4. Chatterjee (KDC), Parasitology, Chatterjee Medical Publishers, Calcutta.
5. Paniker (C.K. Jayaram), Text book of Medical Parasitology, Jaypee, New Delhi.
6. Bhatia and Ichhpujani, Essential of Medical Microbiology, Jaypee, New Delhi.
7. A text book of Microbiology by Chakraborty, New Delhi.

## **REFERENCE BOOKS :**

### **LEVEL - I**

1. Greenwood, Medical Microbiology, Ed-15, Churchill Livingstone.
2. Roitt (Ivan.M), Essential Immunology, Ed.6, ELBS, Hong Kong.
3. MIMS (Cedric, Playfair) et al, Pathogenesis of Infectious diseases, Academic Press, London.
4. RIPPON, Medical Mycology, Ed.2, W.B. Saunders and Co.
5. KONEMAN (Allen and Janda et al), Diagnostic Microbiology, J.B. Lippincott Co.
6. BELLANTI, Immunology, Ed.3, W.B. Saunders and Company.

### **LEVEL - II**

1. BAOWS, Manual of clinical Microbiology, ASM, Washington DC.
2. STITES (Terr and Parslow), Medical Immunology, Appleton and Lange USA.
3. ROITT (Brostoff and Male), Immunology, Mosby, London.
4. EMMONS (Binford) et al, Medical Mycology, K.M. Varghese Co., Bombay.
5. MANSON-BARR (BELL), Monson's Tropical diseases, ELBS.
6. BEAVER, (Jung and Corpp), Clinical Parasitology.

### **LEVEL III**

1. TOPELY AND WILSON - Principles of Bacteriology, Virology, Immunity, Edward Arnold.
2. BERGEY'S manual, (Holt and Kreig) et al, Determinative bacteriology, Williams and Wilkins, Maryland, USA.
3. Roitt, Encyclopedia of Immunology, Academic Press Ltd., London
4. HOEPFICH, Infectious diseases, Harper and Row Publishers, Philadelphia.
5. MENDELL (Donerglas Aan Bennett), Principles and Practice of Infections diseases, Churchill Livingstone.

## **DIAGNOSIS MICROBIOLOGY**

1. BAILEY AND SCOTT, Diagnostic Microbiology, Mosby Publishers
2. MACKIE & MACCARTNEY - Vol II (Collee & Duguid) et al, Churchill Livingstone.
3. Clinical Microbiology procedures Handbook, Henry D. et al, ASM.
4. COWAN & STEEL (Barrow & Feltham), Manual for the identification of medical bacteria, Cambridge University Press.
5. STOKES (Ridgeway & Wren), Clinical Microbiology, Edward Arnold, London.
6. Basic Laboratory Procedures in Clinical Bacteriology, WHO, Vandepitte et al, Jaypee.
7. Basic Laboratory Procedures in Medical Parasitology, WHO, Vandepitte et al, Jaypee.
8. COLLINS & Lyne, Microbiological Methods, Butterworth - Heinemann Ltd.

\* Specification mentioned such as edition, number of pages, cost etc.. subject to change with newer edition.

# FORENSIC MEDICINE AND TOXICOLOGY

## GOALS AND OBJECTIVES

At the end of the course in the Forensic Medicine the MBBS student will :

- Be able to identify, examine and prepare report or certificate in medico legal / cases/situations in accordance with the law of land.
- Able to perform medico legal postmortem and interpret autopsy findings and results of other relevant investigations to logically conclude the cause, manner and time since death.
- Be aware of medical ethics, etiquette, duties, rights, medical negligence and legal responsibilities of the physicians towards patient, profession, society, state and humanity at large.
- Be aware of relevant legal / court procedures applicable to the medico legal / medical practice.
- Be able to preserve and dispatch specimens in medico legal / postmortem cases and other concerned materials to the appropriate government agencies for necessary examination.
- Manage medico legal implications, diagnosis and principles of therapy of common poisons.
- Be aware of general principles of analytical, environmental, and occupational and preventive aspects of toxicology.
- Understand different types of Bio-medical waste, their potential risks and their management.

## COURSE CONTENTS

### THEORY

#### **Forensic medicine:**

Must know

1. History of Forensic Medicine, Definition of forensic medicine and medical jurisprudence, Medical Etiquette.
2. Courts in India and their powers : Supreme Court, High Court, Sessions Court, Additional sessions court, magistrate's court, Coroner's Court.
3. Court procedures : Summons, conduct money, oath, affirmation, perjury, types of witnesses, types of examination, recording evidence, court questions, conduct of doctor in witness box, medical examiner system.

4. Medical certification and medico legal reports including dying declaration.
5. Death :
  - a. Definition, types : somatic, cellular and brain death.
  - b. Natural and unnatural death.
  - c. Presumption of death and survivorship.
  - d. Suspended animation.
  - e. Death certification, cause of death as per international classification of diseases - WHO guidelines.
6. Changes after death :
  - a. Cooling of body, Lividity, Rigor mortis, cadaveric spasm, cold stiffening and heat stiffening
  - b. Putrefaction, mummification, adipocere and maceration.
  - c. Estimation of time of death.
  - d. Embalming.
7. Inquest by police, magistrate and coroner.
8. Identification.
  - a. Definition, corpus delicti
  - b. Identify of living persons; race, age, sex, religion, complexion, stature.
  - c. Identification of criminals, unknown persons, dead bodies and remains of a persons by : hair fiber, teeth, anthropometry, dactylography, foot prints, scars, tattoos, poroscopy, DNA finger printings, Super-imposition.
9. Examination of mutilated human remains; Skeletal remains; and exhumation.
10. Medico legal autopsies :
  - a. Definition of a medico legal post mortem.
  - b. Difference between pathological and medico legal post mortem
  - c. Objectives, procedures, formalities of medico legal autopsies.
  - d. Obscure autopsy
  - e. Special procedures in suspected poisoning.
  - f. Precautions in autopsy of HIV infected body, radiation injury.
11. Mechanical injuries and wounds :
  - a. Definition, classification and differentiation of abrasion, confusion, laceration, incised wounds, stab wounds.
  - b. Accidents due to vehicles : injuries of primary and secondary impact crush syndrome, reconstruction of accidents, railway injuries.
  - c. Differences between ante mortem and postmortem injuries.
  - d. Weapons : weapons, dangerous weapons and elementary ballistics.
  - e. Wounds due to weapons : Injuries by dangerous weapons, fire arm wound blast injuries, stab wounds, incised wound, defense cuts, hesitation cuts self inflicted injuries, fabricated wounds.
  - f. Workman's compensation act.
  - g. Justifiable homicide, culpable homicide and grievous injury.

**12. Examination of an injury case :**

- a. Differences between accidental; suicidal and homicidal injuries.
- b. Types of injuries : simple, grievous and fatal.
- c. Wound as a cause of death : primary, secondary.
- d. Situation and character of wounds : number, direction, extent and age of injury.
- e. Injuries of various sites.

Head : Scalp wounds, fracture skull, coup, contra coup injuries.

Intracranial haemorrhage, its location and extent. Injury to brain, spinal cord spine, eye.

Thoracic, Abdominal, Pelvic viscera, Uterus : Pregnant and non-pregnant, external genitalia, Bones, joints and limbs.

- f. Wound Certification.

**13. Injuries due to physical agents, and their medicolegal importance; cold, heat burns, electricity and lightning.**

**14. Asphyxial deaths : definitions, causes, types, post mortem appearance and medico legal significance of suffocation, drowning, hanging, throttling, strangulation. Traumatic asphyxia and drowning. Lynching, judicial hanging, bandsola.**

**15. Death due to malnutrition, neglect, battered babies.**

**16. Dowry deaths.**

**17. a. Virginity : Definition and signs. Defloration**

- b. Sexual Offences : Rape, Definition, examination of victim and the accused in case of rape, gang rape, custodial rape. Incest, Unnatural Offences - Tribalism, Bestiality, Buccal Coitus. Sexual Perversions :- Sadism, Masochism, Transvestitism, Voyeurism, Indecent assault, Sodomy.

**18. Legitimacy, paternity, disputed paternity, medicolegal significance of impotence. Sterility and artificial insemination; super-foetation and super-fecundation; atavism; sterilization.**

**19. Pregnancy and delivery : Pregnancy : signs of pregnancy in the living and in the dead, Delivery : signs of recent and remote delivery in the living and in the dead; Abortion: natural and artificial therapeutic miscarriage; complications of abortion; investigation in deaths due to abortion. Medical termination of pregnancy act of 1971.**

**20. Infanticide : Definition and Medico legal consideration : viability; determination of the age of the foetus' method of demonstration of centers of ossification rule of Haase, signs of live birth; Hydrostatic test. Maceration, post -mortem finding to differentiate still birth from a live birth. Battered Baby syndrome and Munchausen syndrome by proxy. Sudden infant death and cot death, Precipitate labour.**

**21. Biological fluids : examination, preservation, dispatch and identification of blood stains by micro chemical, spectroscopic and precipitation test. Blood grouping in disputed paternity; group specific substances; hazards of blood transfusion.**

22. Seminal stains: examination, identification, collection, preservation, dispatch.
23. Bio-medical Waste : Types, potential risks and their safe management.

Desirable to know

Brief update on recent advances : HLA typing, DNA typing.

## **II. FORENSIC PSYCHIATRY**

Must know

1. Definition, types of mental disorders, lucid interval.
2. Mental Health Act.
3. Diagnosis of Mental illness and feigned mental illness.
4. Testamentary capacity, restraint, insanity with reference to civil and criminal responsibilities, doctrine of diminished responsibility, McNaughten's rule.

## **III. MEDICAL JURISPRUDENCE**

1. Indian Medical Council and State Medical Councils : their disciplinary control
2. Indian Medical Register rights and privileges of registered medical practitioner, penal erasure, infamous conduct, and disciplinary committee.
3. Code and law of medical ethics, unethical practice, dichotomy, consumer protection act
4. Professional secrecy, privileged communication.
5. Malpractice : civil, criminal and ethical.
6. Consent, negligence, vicarious liability, the doctrine of Res Ipsa Loquitur, contributor negligence. Consumer protection act.
7. Duties of a medical practitioner towards his patient and the society.
8. Human organ Transplantation act of 1994.
9. PNDT act 2002, Acts relevant to torture
10. Sex determination by Amniocentesis.
11. Euthanasia.
12. Torture medicine
13. The Biomedical Waste (Management & Handling) (Second Amendment) Rules. 2000

## **IV TOXICOLOGY**

### **Must know**

#### **1. General aspects of poisoning :**

Duties of doctor in cases of poisoning, medicolegal autopsy in poisoning, preservation and dispatch of viscera for chemical analysis. Role of Forensic Science laboratory. Laws related to poisons.

#### **2. Types of poison, diagnosis, principles of therapy and medico legal aspects of :**

- a. Corrosive poisons; strong mineral acids like carbolic acid, oxalic acid, Sulphuric acid, Nitric acid, Hydrochloric acid, Alkalies.
- b. Metallic poisons : Lead, Mercury, Copper, Arsenic.
- c. Animal poisons : Snakes, Scorpions, Bees, Wasps.
- d. Deliriants : Dhatura, Cannabis and Cocaine
- e. Somniferous agents : Opium, Morphine and Pethidine
- f. Inebriants : Methyl and ethyl alcohol.
- g. Gaseous poisons : Carbon monoxide, carbon dioxide, War gases.
- h. Anaesthetic agents : Chloroform and ether.
- i. Cardiac poisons : Aconite, Cerebra thevetia and Nerium odalum, Oleanders Hydrocyanic acid.
- j. Miscellaneous : Aspirin, Paracetamol, Barbiturates, diazepam and antihistamines
- k. Insecticides : organophosphorous compound, endrin, Kerosene, Turpentine. Rodenticides.
- l. Food poisoning : Botulism.
- m. Organic vegetables: Abrus, Calotropics.

### **Desirable to know**

- a. Inorganic non metallic poisons : phosphorous.
- b. Metallic poisons : Antimony, Nitrates and Arsenic
- c. Vegetable Alkaloids.
- d. Spinal poisons : strychnine
- e. Paralytic agents.
- f. War gases and industrial gases : MIC
- g. Sedatives : Chloral hydrate and Bromides.
- h. Mechanical Poisons.
- i. Drug Dependence.

## **PRACTICALS**

1. Demonstration of ten medico legal autopsies
2. Age estimation from bones, x-rays, dentition
3. Injuries and weapons
4. Examination of intoxicated persons
5. Possible videotape of examination of victim and accused in sexual offences
6. Specimens of poisons

## **SKILLS**

1. Examine & prepare certificates in the following medico-legal situations :

- a. injured patient
  - b. sexual offences
  - c. determination of age
  - d. intoxicated patient
2. Prepare proper certificates of birth and death
  3. Prepare dying declaration
  4. Give evidence in a court of law as an expert witness
  5. Collect and do proper labeling, preservation and dispatch of medico-legal specimens
  6. Witness and record the finding and issue a report for a medico legal autopsy
  7. Diagnose and manage common acute and chronic poisonings

## PRACTICAL EXERCISES

1. Medico Legal Autopsies - Witnessing and recording (10 cases)
2. Age estimation of an individual by Physical, Dental and Radiological examination
3. Examination of skeletal remains
4. Study of:
  - a. Lethal Weapons
  - b. Wet specimen / models / Photography / Micro slides - Like sperms, Diatoms, Hairs, Human & Animal RBCs.
  - c. Poisons
5. Medical certificates / Medico-legal reports, Physical fitness and sickness and death certificates, injury report, drunkenness, sexual offender.
6. Students should be taken to courts whenever possible to acquaint themselves with the court proceedings.

Note: Practical Exercises conducted shall be entered in the practical record book edited and published by Karnataka Medico legal society.

## TEACHING HOURS

III term - 1 hrs. Theory / week

IV term - 1 hrs. Theory & 1 Practical / week

V term - 2 hrs. Theory & 1 Practical / week

The course will be for 18 months in III, IV and V terms

## Integrated Teaching : 10 Hours

## SCHEME OF EXAMINATION

## INTERNAL ASSESSMENT

It shall be based on evaluation of assignment, preparation of seminar, clinical presentation etc., (see Annex - I for examples). Regular periodic examinations should be conducted throughout the course. Although the question of number of examinations is left to the institution, there should be a minimum of at least three (3) sessional examination marks should be taken into consideration while calculating the marks of the internal assessment. Day to day records should be given importance in the internal assessment.

Proper record of the work should be maintained which will be the basis of all students internal assessment and should be available for scrutiny.

### **THEORY: 30 Marks**

Minimum of three examinations are recommended. The examination preceding the University examination will be similar to the University Examination. The total marks would be 30. Average marks of best of two notified internal examinations should be reduced to 30 and should be sent to the University.

### **PRACTICALS : 10 Marks**

Internal Assessment examination for Practicals and allotment of marks for records will be as follows : The total of 10 marks will be first increased notionally to 50. Out of the 50 marks, 40 will be allotted to terminal practical tests and 10 marks for records. Four practical tests shall be conducted each carrying 10 marks. The marks obtained in the four practical tests and records would be reduced to 10 and sent to the University.

### **UNIVERSITY EXAMINATION :**

#### **A. WRITTEN PAPER : 100 Marks**

There shall be one theory paper of 100 marks. The pattern of questions would be of three types.

Type of Questions	Number of questions	Marks for each questions	Total
Long Essay	2	10	20
Short Essay	10	5	50
Short Answer	10	3	30
Total Marks			100

**The distribution of topics and weightage of marks for University examination is as under \*:**

#### **Forensic Medicine(I, II & III) : 80 Marks**

#### **Toxicology : 20 Marks**

Forensic Medicine - I	
1,2,3,4 and III Medical Jurisprudence	12 Marks
5,6,7,8.	12 Marks
9,10,11	12 Marks
12,13,14,15	12 Marks
16,17,18.	10 Marks
19,20,21	12 Marks
II Forensic psychiatry	10 Marks
Toxicology	20 Marks

## **B. PRACTICAL EXAMINATION : 40 Marks**

This will carry 40 Marks. The distribution of marks for different components are :

Age estimation	- 10 Marks
X Rays/Bones	- 10 Marks
Autopsy questions	- 05 Marks
Spotters	- 10 Marks
Medical certificates	- 05 Marks

## **C. VIVA - VOCE EXAMINATION : 20 Marks**

This will carry 20 marks. All the examiners will examine the candidates.

### **RECOMMENDED BOOKS:**

1. Narayananreddy K.S., The Essentials of Forensic Medicine & Toxicology, 20th Edition, 2001, Published by K. Suguna Devi, Hyderabad.
2. Apurbanandy, Principles of Forensic Medicine, 2nd Edition, 2001, Pages 606, Published by New Central Book Agency.
3. Parikh C.K., Parikh's Textbook of Medical Jurisprudence and Toxicology, 7th Edition, 2001, CBS. Publishers, Bangalore.
4. Guharaj P.V., Forensic Medicine, Rs. 140/-, Orient Longman Limited.
5. C.A. Franklin, Modi's Medical, jurisprudence and Toxicology, 21st Edition, Rs. 180/- Published by M. Tripathi Private Limited, Bombay.
6. Parikh C.K., Medico Legal Post Mortem in India, Rs. 230/- Published by Medical Publication.
7. Keith Simpson, Bernard Knight, Forensic Medicine, Ninth Edition, 1985, ELBS.
8. Pillay V.V., Text Book of Forensic Mediicne, Paras Publication, III edition, 2004.

**\* Specification mentioned such as edition, number of pages, cost etc., subject to change with newer edition.**

# PHARMACOLOGY

## GOALS AND OBJECTIVES

The student after completing the course in Pharmacology will be able to :

- Understand the general principles of drug action and the handling of drugs by the body.
- Select and prescribe suitable drug(s) according to the need of the patient for prevention, diagnosis and treatment of common ailments.
- Foresee, recognize, prevent and manage adverse drug effects.
  - a. Avoid simultaneous use of drugs resulting in harmful interaction(s)
  - b. Judiciously use rational drug combinations in the best interest of the patient.
- Be aware of the contribution of both drug and non drug factors in the outcome of treatment.
- Appreciate the essential drug concept and translate it in terms of drug needs for a given community.
- Judiciously use "over the counter" drug and be aware of ill effects of social use of intoxicants.
- Exercise caution in prescribing drug(s) likely to produce dependence and be aware of treatment strategies for drug dependence.
- Be aware of the drug treatment guidelines laid down for diseases covered under National Health Programmes.
- Prescribe drug(s) for the control of fertility.
- Be aware of possible adverse effects of drugs on the foetus while treating pregnant woman.
- Be aware of the age related factors while prescribing treatment in relation to infant children/geriatric patients.
- Understand different types of Bio-medical waste, their potential risks and their management.

## COURSE CONTENTS

### I. GENERAL PHARMACOLOGY

Must know

1. Definition and scope of Pharmacology and its different branches, route of administration of drugs, advantages and disadvantages of different routes.
2. General principles of drug action.

3. Basic principles of pharmacokinetics and its relevance to rational therapeutics.
4. Biotransformation of drugs and factors affecting it.
5. Basic mechanisms of drug interactions.
6. Various types of adverse effects that can occur with therapeutic use of drugs. Concept of therapeutic index and margin of safety.
7. Mechanism of drug action; factors modifying drug action and dosage including dose response relationship.
8. Drugs and drug combinations that are banned in India.
9. Bio-availability and bio-equivalence of drugs.
10. Clinical Pharmacology : definition, purpose and scope.

Desirable to know

11. Molecular mechanisms of drug action.
12. Modern drug delivery systems and principles underlying them.

## **II. AUTONOMIC NERVOUS SYSTEM**

Must know

1. General principles of autonomic neurotransmission with reference to cholinergic and adrenergic systems : various types and sub-types of receptors and their agonists and antagonists.
2. Therapeutic indications, common side effects and contraindications of cholinomimetics (including anti-cholinesterases) and cholinergic blocking (antimuscarinic) drugs. Steps in the pharmacotherapy of organophosphorous and atropine poisonings, pharmacotherapy of glaucoma and myasthenia gravis.
3. Therapeutic indications, common side effects and contraindications of alpha 1, alpha 2, Beta 1 and 2 selective and non-selective adrenoreceptor agonist and antagonists.
4. Skeletal muscle relaxants: names, pharmacological actions, side effects.
5. Drugs used in Parkinsonism.

Desirable to know

1. Molecular and biochemical mechanisms of action of cholinergic drugs. Adrenergic drugs and their blockers.

### **III CARDIO-VASCULAR SYSTEM**

Must know

1. a. Pharmacological actions of cardiac glycosides and the basis of their use in congestive heart failure (CHF) and arrhythmias.  
b. Pharmacokinetics, drug interactions, adverse effects and contra indications of digoxin; treatment of digoxin toxicity.  
c. Approaches to the treatment of CHF and the status of diuretics, digitalis and vasodilators in its management.
2. a. Classification of antihypertensive drugs. Mechanism of action, adverse effects, drug interactions and basis of combining commonly used agents like Beta blockers, diuretics, ACE inhibitors, calcium channel blockers, clonidine.  
b. Management of hypertensive emergencies.
3. Classification of drugs used in angina pectoris. Nitrates : pharmacological actions, mechanisms of beneficial effect in angina, adverse effects and phenomenon of nitrate tolerance.
4. Calcium channel blockers : pharmacological actions, adverse effects & indications
5. Approaches to the treatment of myocardial infarction.
6. Drug treatment of shock and peripheral vascular diseases.

### **IV DIURETICS**

Must know

1. Classification of diuretics : site of action of diuretics of different classes & pattern of electrolyte excretion under their influence.
2. Short term side effects and long term complications of diuretic therapy.
3. Therapeutic uses of diuretics.

Desirable to know

1. Anti diuretics
2. Diabetes insipidus.

### **V DRUGS AFFECTING BLOOD AND BLOOD FORMATION**

Must know

1. Antianaemic drugs
  - a. Mechanisms of iron absorption from gastrointestinal tract and factors modifying it. Bioavailability, adverse affects and indications of oral and parenter iron preparations. Treatment of iron deficiency anemia.

- b. Indications of folic acid, Vit. B 12, Vit K.
- 2. Classification of anticoagulants. Mechanisms of action of heparin and or anticoagulants. Drug interactions with oral anticoagulants and treatment of bleeding due to their overdose.
- 3. Drugs inhibiting platelet aggregations, their indications and precautions in their use.
- 4. Properties and indications of plasma expanders.

Desirable to Know

- 1. Disadvantages of 'shot gut' anti-anemia preparations.
- 2. Name and indications of fibrinolytics and antifibrinolytics.
- 3. Hypolipoproteinemic drugs : mechanisms of action, adverse effects and indications.

## VI AUTOCOIDS AND RELATED DRUGS

Must know

- 1. Definitions of autocoids and their difference from hormones.
- 2. Pharmacological actions of the autacoids and their pathophysiological roles.
- 3. The subtypes of histamine receptors and the actions mediated through each.
- 4. Histamine H<sub>1</sub> receptor antagonists : classification, pharmacological actions, adverse effects and therapeutic uses.
- 5. Angiotensin converting enzyme inhibitors : pharmacological actions, pharmaco-kinetics, adverse effects, drug interactions and therapeutic uses.
- 6. Established and potential therapeutic uses of prostaglandins and their analogues
- 7. Eicosanoids and Platelet Activating factor
- 8. Analgesics, Antipyretics, and anti-inflammatory drugs
- 9. Drugs used for Rheumatoid arthritis and Gout.

Desirable to know

- 1. Drugs which release histamine in the body and clinical implications of this property.
- 2. The sub types of 5 HT receptors and drugs, which act by modifying the serotonergic system.
- 3. Antioxidants

## VII RESPIRATORY SYSTEM

Must know

Drugs used in management of asthma, common side effects and precautions to be taken during their use. Principles governing the selection of drugs for asthma.

Desirable to know

1. Classification of antitussives based on their mechanism of action, pharmacological actions, indications, contraindications and common side effects of antitussives.
2. Expectorants and mucolytic agents : outline of their mechanisms of action indications, common side effects and precautions to be taken during their use. Principles of choosing appropriate combination of cough remedies.

## **VIII GASTRO-INTESTINAL SYSTEM**

Must know

1. Drugs for peptic ulcer.
  - a. Drugs used in the treatment of peptic ulcer & outline of pharmacological basis of the use of each.
  - b. Side effects, contraindications and precautions for the use of the various drugs used in peptic ulcer.
2. Antiemetic drugs and outline of their mechanism of action.
3. Drugs used in diarrhoea.
  - a. Symptomatic management of diarrhoea giving the pharmacological basis for the use of each drug / measure.
  - b. Oral rehydration powder
  - c. Indications for the use of anti microbials, anti-motility agents and antisecretor drugs.
4. Indications, limitations and hazards of purgatives.

Desirable to know

1. Drugs used in therapy of ulcerative colitis outlining the pharmacological basis for the use. Side effects, contraindications and precautions during use of these agents

## **IX ENDOCRINE PHARMACOLOGY**

Must know

1. Hormones of thyroid : physiological and pharmacological actions, indications, contraindications and common side effects of thyroid hormones used for replacement and for pharmacotherapy. Anti-thyroid drugs : pharmacological actions, adverse effects.
2. Hormones of the islets of Langerhans : Drugs used for pharmacotherapy of diabetes mellitus, their contraindications, precluding their use and common side effects. Management of iatrogenic hypoglycemia and diabetic ketoacidosis.
3. Sex hormones : synthetic analogues and antagonists, uses in replacement and pharmacotherapy outlining the rationale for such use, Contraindications and common side effects.

4. Pharmacological approaches to contraception, Side effects, precautions during use & contraindications for the various modalities of drug induced contraception.
5. Uterine stimulants & relaxants : their indications, contraindications and important side effects.
6. Hormones of adrenal cortex and their synthetic analogues : pharmacological actions, therapeutic uses, contraindications, precautions during their use and common side effects. General principles governing the pharmaco therapy with glucocorticoids.

Desirable to know

1. Hormones and drugs affecting calcium metabolism, their therapeutic indications, contraindications and common side effects.
2. Importance of drug induced alterations in prolactin levels.
3. Pharmacology of Anterior Pituitary hormones.

## X. CENTRAL NERVOUS SYSTEM

Must know

1. Drugs used in epilepsy; selection of appropriate drug for the various types of epilepsy and adverse effects of the drugs.
2. Hypnotics used currently in clinical practice with indications, contraindications, adverse effects and drug interactions of benzodiazepines.
3. Opiod analgesics : pharmacological actions, indications, contraindications and adverse effects of commonly used analgesics.
4. Aspirin and Aspirin like (NSAID's) drugs, their relative advantages and disadvantages, indications, adverse effects and drug interactions.
5. Agents used in the treatment of acute and chronic gout..
6. Role of disease modifying agents in the treatments of rheumatoid arthritis.
7. Pharmacological effects of ethanol in methanol poisoning.

## XI PSYCHOPHARMACOLOGY

Must know

Drugs used for psychosis, anxiety, depression and manic depressive illness.

Desirable to know

Names of hallucinogens : actions and abuse potential of cannabis indica, cocaine and opiods.

## **XII DRUGS IN ANAESTHETIC PRACTICE**

Must know

1. General Anesthetics
  - a. Cardinal features of general anesthesia.
  - b. Merits and demerits of commonly used anaesthetic agents.
  - c. Properties of thiopentone sodium as an inducing agent and the basis of its short duration of action.
  - d. Complications of general anesthesia and drug interactions with general anesthetics.
2. Preanesthetic adjuvants : Names of drugs used in pre-anesthetic medication and the purpose of using each of them.
3. Local Anesthetics :
  - a. The pharmacological basis of local anaesthetic action and of combination of local anaesthetic agents with adrenaline.
  - b. Common adverse effects of local anesthetics.
  - c. Indications for the complications of spinal anesthesia.

Desirable to know

1. Other anesthetics like ketamine and neuroleptic analgesia.
2. The pharmacology of dantrolene and centrally acting muscle relaxants like diazepam, carisoprodol and baclofen.

## **XIII CHEMOTHERAPY**

Must know

1. General principles of chemotherapy, indications for prophylactic and combined use of chemotherapeutic agents. Chemotherapeutic agents in the order of their choice for various infections and infestations, common side effects, contra indications and precautions.
2. Antiseptics and disinfectants and their uses based on their Pharmacological properties.
3. Anticancer drugs : mechanisms of action, use, Common side effects, contraindication and precautions during use of various anticancer drugs.
4. Chemotherapy of drugs used in tuberculosis, leprosy, malaria, filaria, amoebiasis, Kala-Azar, enteric fever, worm infestation.
5. Anti fungal agents.
6. Chemotherapy of viral infections including possible approaches to treatment of viral infections like AIDS.

Desirable to know

1. Methods to circumvent toxic / side effects of chemotherapeutic agents wherever possible.
2. Chemotherapeutic agents in fungal infections : superficial and systemic.

#### **XIV TOXICOLOGY**

Must know

1. General principles of treatment of poisoning.

Desirable to know

1. Heavy metal toxicity and heavy metal antagonists.
2. Management of over dosage with commonly used therapeutic agents.

#### **XV CLINICAL PHARMACOLOGY AND RATIONAL DRUG USE**

Must know

1. Principles of prescription writing.
2. Prescriptions of common disorders.
3. Essential drug concept
4. Drugs in children and pregnancy (perinatal pharmacology)
5. Drugs in geriatrics.
6. Drug-drug interactions (with specific examples)
7. Drug resistance
8. ADR monitoring and reporting

Desirable to know

9. Therapeutic drug monitoring.
10. Clinical use of drugs in hepatic and renal failure.

#### **XVI. BIO-MEDICAL WASTE : Types, potential risks and their safe management.**

#### **SKILLS**

1. Plan and institute a line of treatment which is need based, cost effective and appropriate for common ailments taking into consideration:

- a. Patient
  - b. Disease
  - c. Socioeconomic status,
  - d. Institutional / governmental guideline.
2. Identify irrational prescriptions and explain their irrationality.
  3. Persuade patients to stick to therapeutic recommendations especially with reference to dosage and duration of therapy and monitor compliance.
  4. Warn patients about important side effects of drugs without alarming them.
  5. Recognize drug induced untoward effects and take appropriate steps to all them.

### **COMMON AREAS FOR INTEGRATED TEACHING OF PHARMACOLOGY**

Sl. No.	Area	Collaborating Department
1.	Drugs in anaesthetic practice	Anesthesiology
2.	Drug therapy of psychiatric disorders	Psychiatry
3.	Principles of rational use of drugs	Medical, Pediatrics, Surgery, Obst. & Gynae.
4.	The concept of essential drugs	Preventive and Social Medicine
5.	Therapy of hypertension including Diuretics	Medicine and Physiology
6.	Therapy of diabetes	Medicine and Physiology
7.	Therapy of peptic ulcer	Medicine, Physiology and Surgery
8.	Therapy of CCF	Medicine
9.	Therapy for Asthma	Medicine
10.	Therapy of Malaria	Medicine and Microbiology.
11.	Therapy of tuberculosis	Medicine, Microbiology
12	Therapy of Leprosy	Medicine and Microbiology.

### **TEACHING HOURS**

**Theory :** (120-130 hours)

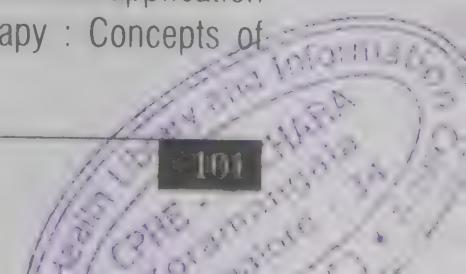
Theoretical coverage of various aspects of pharmacology could be covered in lectures tutorials, group discussions, seminars etc., suitably spread over the three terms course for 1½ years. Stress to be given for the basic principles and pharmacotherapeutic basis for clinical use of drugs. The term wise distribution of topics is a suggestion, the teaching can be adjusted to the local feasibility.

#### **I TERM (3rd TERM) :**

##### **A. General Pharmacology :**

History, Definitions and Routes of administration of drugs. Basic principles an clinical application of pharmacokinetics and Pharmaco dynamics. Rational approach to therapy : Concepts of

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essential drugs and rational drug prescribing and adverse drug reactions, cost benefits, therapeutic drug monitoring. Drug monitoring, Drug toxicity, Drug interactions, principles of assay of drugs : Bicassay, radical immunoassay etc., Principles of drug development and clinical evaluation of drugs. - 12 hours

- B. Pharmacology of ANS including parkinsonism - 15 hours
- C. Pharmacology of CVS including pharmacotherapy of shock and Hypolipidemic agents. - 13 hours
- D. Drug acting on blood and blood forming organs - 05 hours

## **II TERM (4th TERM) :**

- A. Pharmacology of CNS including psychopharmacology and drug dependence. - 18 hrs.
- B. Pharmacology of local anesthetics - 02 hrs.
- C. Diuretics and anti-diuretics - 04 hrs.
- D. Endocrine glands : Hormones of pituitary, Thyroid antithyroid agents, adrenal corticoids, pancreatic hormones and antidiabetic agents, sex hormones including contraceptives. Drugs influencing calcium metabolism. - 15 hrs.
- E. Biogenic amines and polypeptides - 06 hrs.

## **III - TERM (5th Term) :**

- A. Chemotherapy : Sulfonamides and Synthetic drugs, Antibiotics, Chemotherapy of bacterial, parasitic, fungal, viral infections, Chemotherapy of malignancy. Drug therapy of scabies, pediculosis and other skin infections. - 25 hrs.
- B. Antiseptics and disinfectants - 01 hrs.
- C. Pharmacology of Respiratory system. - 02 hrs.
- D. Pharmacology of Gastrointestinal system - 05 hrs.
- E. Drugs acting on uterus - 01 hrs.
- F. Miscellaneous : a) Chelating agents b) Vitamins c) Immuno-suppressants and Immunostimulants d) Drugs used in gout and rheumatoid arthritis e) Therapeutic gases and enzymes. - 06 hrs.
- G. Concept of essential drugs and rational use of drugs
- H. WHO Guide to Good Prescribing

## **PRACTICALS : 144 hrs**

The practical training should be made need based. It should be relevant to the future function of a basic doctor as well as make the student to understand some of the theoretical knowledge imparted to them through lectures. Some of the experiments in the experimental laboratory may be done by the students themselves while others can be demonstrated depending upon the local conditions.

### **I - TERM :** (40 hrs)

#### **PRACTICAL PHARMACY**

Mixtures, percentage solutions, ointments, paints, paste, powders, liniments etc. At least one exercise on each of these types of preparations to be done by the students. Exercises done in these are to be asked as practical exercise at the qualifying examination.

1. The students should be trained to identify, handle and explain the use of various dosage forms to the patient.
2. Students should be trained to interpret the label of commercial preparations.

#### **Proposed practicals are :**

1. Dosage forms: I, II and III
2. Calculating dosage and percentage of solutions.
3. Counseling for different dosage forms.

### **II - TERM**

#### **EXPERIMENTAL PHARMACOLOGY** (40 hrs)

Experiments designed to elucidate and demonstrate some basic principles like mechanism of drug action, drug antagonism, drug interactions etc., are demonstrated and some done by the students.

Some of the exercises listed below may be suitably utilized or modified for the above purpose :

1. Frog heart preparation to show effect of autonomic drugs on ions.
2. Frog rectus preparation to show neuromuscular drugs action.
3. Mammalian smooth muscle (rabbit, guinea pig, rat etc.) to show drug effects and drug antagonism.
4. Mydriatic and meiotic effects on rabbit pupil.
5. Drug action on ciliary movement of frog oesophagus.
6. Anaesthesia: Frog plexus, surface anaesthesia in rabbits infiltration in guinea pig.
7. Demonstration of animal experiment using computer aided demonstrations may be included as part of experimental pharmacology." Experiments on whole animals may be included in place of isolated tissue wherever feasible.

Eg:

- Effect of drugs on rabbit eye.

- Induction of catalepsy in rat / mice.
- Sleeping time in mice.
- Effects of drugs on spontaneous motor activity & exploratory behaviour.
- Skeletal muscle relaxants.
- Effects of analgesics.

### **III TERM :**

(64 hrs)

#### **1. Clinical pharmacology :**

- a. Clinical problem solving exercises oriented toward drug interaction, rational drug therapy etc.,
- b. Prescription writing for common clinical conditions
- c. Criticize, correct and rewrite the given prescriptions (Therapeutic & drug interactions oriented)
- d. Case studies to study rational therapeutics
- e. Analysis of rationality of fixed dose combination
- f. Critical evaluation of promotional drug literature.
- g. Getting conversant with source of drug information
- h. Cost comparison of branded preparations

#### **Integrated Teaching : 36 Hours**

#### **SCHEME OF EXAMINATION**

#### **INTERNAL ASSESSMENT**

It shall be based on evaluation assignment, preparation of seminar, clinical presentation etc., (see Annex - I for examples). Regular periodic examinations should be conducted throughout the course. Although the question of number of examinations is left to the institution, there should be a minimum of at least three (3) sessional examinations during Phase-II of the course and average of best two examination marks should be taken into consideration while calculating the marks of the internal assessment. Day to day records should be given importance in the internal assessment.

Proper record of the work should be maintained which will be the basis of all students' internal assessment and should be available for scrutiny.

#### **THEORY : 60 Marks**

Minimum of three examinations are recommended. The examination preceding the University examination will be similar to the University examination. The total marks would be 60. Average marks of best of two notified internal examinations should be reduced to 60 and should be sent to the University.

#### **PRACTICALS : 20 Marks**

A minimum of three practical tests is to be conducted, one at the end of each term. Five marks will be for records and 15 marks for terminal examinations. Average marks of the three terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and sum of the two shall be sent to the University.

## **UNIVERSITY EXAMINATION**

### **A. WRITTEN PAPER : 200 Marks**

There shall be two theory papers of 100 marks each and duration of each paper will be of 3 hours.

Type of Questions	Number of questions	Marks for each questions
Essay type questions	2	10
Short Essay types questions	10	5
Short answer questions	10	3

Distribution of chapters/topics for paper I and II with weightage of marks for University Examination is given below \*:

#### **Paper I : 100 marks**

- |                                                                                  |          |
|----------------------------------------------------------------------------------|----------|
| 1. General Pharmacology including clinical pharmacology                          | 15 marks |
| 2. Central Nervous System & Local Aesthetics                                     | 25 marks |
| 3. Autonomic Nervous System including Parkinsonism,<br>Skeletal Muscle Relaxants | 25 marks |
| 4. Cardio Vascular System                                                        | 20 marks |
| 5. Blood and Pharmacotherapy of shock                                            | 15 marks |
| 6. Diuretics and Antidiuretics                                                   |          |

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#### **Paper II : 100 marks**

- |                                              |          |
|----------------------------------------------|----------|
| 1. Chemotherapy                              | 40 marks |
| 2. Endocrines (Hormones)                     | 20 marks |
| 3. Gastro Intestinal System                  | 10 marks |
| 4. Autocoids                                 | 10 marks |
| 5. Respiratory System                        |          |
| 6. Chelating agents                          | 10 marks |
| 7. Immunosuppressives                        |          |
| 8. Drugs used in GOUT & Rheumatoid Arthritis |          |
| 9. Vitamins                                  |          |
| 10. Enzymes in Therapy                       |          |
| 11. Drugs acting on Uterus                   | 10 marks |
| 12. Antiseptic and Disinfectants             |          |

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\* The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

### **B. PRACTICAL EXAMINATION : 80 Marks**

**Distribution of Marks for Practical Examination**

<b>PRACTICAL : I</b>	<b>Two hours</b>	<b>:</b>	<b>40 Marks</b>
Spotters			- 10 marks
Prescriptions (2)			- 10 marks
Practical Pharmacy Exercise			
(i) Viva on dosage forms and commercial labels.		- 10 marks	
(ii) Preparations of dilutions.		- 10 marks	

<b>PRACTICAL : II</b>	<b>Two hours</b>	<b>:</b>	<b>40 Marks</b>
• Experimental Pharmacology			
In place of animal experiments the following may be done:			
(i) Criticism of fixed dose combination.		- 10 marks	
(ii) Criticism of commercial preparation		- 10 marks	
• Interpretation of Graph		- 10 marks	
Clinic Pharmacology Problem			
(i) Therapeutic problem		- 05 marks	
(ii) Criticism and rewriting prescription		- 05 marks	

### **C. VIVA - VOCE EXAMINATION : 40 Marks**

All the four examiners will examine all the candidates

Distribution of Marks for Viva Voce Examination

1. General pharmacology, CNS, local anesthetics, Biogenic amines and Polypeptides, Gout and Rheumatoid arthritis. -10 Marks
2. ANS, Parkinsonism, CVS, Blood and Blood forming organs, Hypolipedemic agents, Diuretics - 10 Marks
3. Endocrines, GIT, Uterus, Respiratory System. - 10 Marks
4. Chemotherapy, Antiseptics and Disinfectants, Chelating agents, Vitamins, Immunopharmacology - 10 Marks

### **RECOMMENDED BOOKS**

#### **Theory**

1. R.S. Satoskar, S.D. Bhandarkar, S.S. Ainapure, Pharmacology and pharmacotherapeutics, 18th Edition, Single Volume, M/S. Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay - 400 034.
2. K.D. Tripathi, Essentials of Medical Pharmacology, V Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, EMCA House, 23/23, Bansari Road, Daryaganj New Delhi.
3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition.

4. Katzung, Basic and Clinical Pharmacology, 9th Edition, Lange Medical Books McGrawHill Medical Publishing Division.
5. S.D.Seth, Textbook of Pharmacology, 2nd Edition. B.I.Churchil Livingstone.

### **REFERENCE BOOKS :**

Goodman & Gillman, The Pharmacological basis of Therapeutics, 10th Edition (International Edition), Toel G., Hardman Lee E. Limbird.

### **Practical**

1. R.D. Budhiraja, Manual of Practical Pharmacy, M/s. Popular Prakashana, Bombay 34, Pages : 101, Cost, Rs. 45/-.
2. S.K.Kulkarni, Practical Pharmacology
3. B.P. Jaju, Pharmacology Practical Exercise Book, Jaypee Brothers, P.B. No : 719 G-16 EMCA house, 23/23, B.Anvari Road, Daryaganj, New Delhi.
4. Ravinder Rao, Hand Book of Practical Pharmacology.

# COMMUNITY MEDICINE

## GOALS

The aim of teaching by the department of Community Medicine is directed towards preparation of the medical student to function as community and primary care physician. Towards this end, by completion of training the MBBS student must be

1. Aware of the physical, social, psychological, economic and environmental aspect of health and disease.
2. Able to apply the clinical skills to recognize and manage common health problems including their physical, emotional and social aspects at the individual, family and community levels and deal with public health emergencies.
3. Able to define and manage the health problems of the community he/she serves.
4. Understand different types of Bio-medical waste, their potential risks and their management.

## OBJECTIVES

To achieve this he/she will be able to :

- a. Organize elementary epidemiological studies to assess the health problems in the area. For this he should be able to design a study collect data, analyze it with statistical tests, make a report and be able to participate in a health information systems.
- b. Priorities the most important problems and help formulate a plan of action to manage them under National Health Programme guidelines including population control and family welfare program. (He should be able to assess and allocate resources, implement and evaluate the programmes).
- c. Demonstrate knowledge of principles of organizing prevention and control of communicable and non-communicable diseases.
- d. Organize health care service for special groups like mother infants, under five children and school children, handicapped, adolescents and geriatric, rural tribal and urban slum dwellers.
- e. Organize health care in case of calamities.
- f. Inculcate values like compassion, empathy to poor, rationale and ethical practice, honesty sincerity integrity to ensure quality professional practice.
- g. Able to work as an effective leader of the health team within the primary health care set-up.
- h. Able to coordinate with and supervise other members of the health team and maintain liaison with various agencies. (Government, non-government and voluntary organizations).

- i. Able to plan and implement health education programmes.
- j. Able to perform administrative functions of health centers.
- k. Able to promote community participation especially in areas of disease control, health education and implementation of national programmes.
- l. Aware of national priorities and the goal to be achieved to implement primary health care including health for all.
- m. Understand different type of Bio-Medical waste, their potential risks and their management.

## COURSE CONTENTS

### THEORY

#### I EVALUATION OF PUBLIC HEALTH AND CONCEPTS OF HEALTH

Must know

- 1. Evaluation of Public Health.
- 2. Definition of health; holistic concept of health, appreciation of health as a relative concept, determinants of health.
- 3. Characteristics of agent, host and environmental factors in health and disease and the multi factorial etiology of disease.
- 4. Understanding the Natural history of disease and application, interventions at various levels of prevention with appropriate examples.
- 5. Indices used in measurement of health.
- 6. Health profile in India.

#### II ENVIRONMENT AND HEALTH

Must know

- 1. a. The concept of safe and wholesome water.  
b. The requirements of sanitary sources of water.  
c. Understanding the methods of purification of water on small scale and large scale.  
d. Various biological standards, including WHO guidelines for third world countries.
- 2. Concept and methods for assessing quality of water.
- 3. Sources, health hazards and control of environmental pollution

4. Problem in the disposal of refuse, sullage, human excreta and sewage and its remedies.
5. Awareness of standards of housing and the effect of poor housing on health.
6. Role of vectors in the causation of diseases.
7. Identifying features of and mode of transmission of vector borne diseases.

Desirable to know

1. Methods of vector control with advantages and limitations of each.
2. Mode of action, doses and application cycle of commonly used insecticides and rodenticides.

### **III HEALTH EDUCATION**

(INFORMATION, EDUCATION, COMMUNICATION)

Must know

1. Communicate effectively with individuals, family and community using tools and techniques of information, education, and communication. To do so, the students should know :
  - a. Principles of communication, methods and evaluation of health education and understand and apply adult education methods.
  - b. Appreciate barriers to effective communication.
  - c. List various methods of health education with their advantages and disadvantages.
  - d. Select and use of appropriate media (simple audio-visual) for effective health education.
  - e. Practice of Health Education.
2. Use every opportunity for health education of the individual, family and the community.

### **IV NUTRITION AND DIETETICS**

Must know

1. Common sources of various nutrients and special nutritional requirement according to age, sex, activity, physiological condition.
2. Nutritional assessment of individual, families and the community by selection and using appropriate methods such as : anthropometry, clinical, dietary laboratory techniques.
3. Plan and recommend a suitable diet for the individuals and families bearing mind the local availability of foods economic status, etc.
4. Common nutritional disorders protein energy malnutrition. Vitamin A deficiency anemia, iodine deficiency diseases fluorosis, food toxin diseases and the control and management.
5. National programmes in nutrition.
6. Nutritional surveillance education and rehabilitation.

## **V OCCUPATIONAL HEALTH**

Must know

1. Relate the history of symptoms with the specific occupation including agriculture.
2. Employees State insurance Scheme.

Desirable to know

1. Identification of the physical, chemical biological and social hazards to which workers are exposed to while working in a specific occupational environment.
2. Influence of physical factors like heat, humidity, cold, radiation and noise on the health of the individual and community.
3. General preventive measures against these diseases including accident prevention.
4. Various legislation in relation to occupational health.

## **VI MEDICAL SOCIOLOGY AND COMMUNITY MENTAL HEALTH**

Must know

1. Conduct of a clinico-social evaluation of the individual in relation to social, economic and cultural aspects, educational and residential background; attitude to health, disease and to health services, the individuals, family's and community's
2. Assessment of barriers to good health, recovery from sickness and to lead a socially and economically productive life.
3. Development of good doctor-patient and community relationship.
4. Identification of socio-cultural factors related to health and disease in the context of urban and rural societies.
5. Impact of urbanization of health and disease.
6. National mental health program.

Desirable to know

1. Community psychiatry.

## **VII FUNDAMENTALS OF BIO-STATISTICS**

Must know

1. a. The scope and uses of bio-statistics  
b. Collection of data, common sampling techniques, simple statistical method for the analysis, classification interpretation and presentation of data, frequency distribution, measures of central tendency, measures of variability, laws probability.

- c. Analyze and interpret data.
2. Obtaining health information, computing indices (rates and ratio) and making comparisons.

Desirable to know

1. Apply statistical methods in designing of studies.
  - a. Choosing of appropriate controls.
  - b. Applying tests of significance (large sampling tests)
  - c. Use of statistical tables.

## **VIII BASIC EPIDEMIOLOGY**

Must know

1. Epidemiology : definition, concept and role in health and disease.
  2. Use of basic epidemiological tools to make a community diagnosis of the health situation in orders to formulate appropriate intervention measures.
  3. Definition of the terms used in describing disease transmission and control.
  4. Modes of transmission and measures for prevention and control of communicable and non-communicable diseases.
  5. Principal sources of epidemiological data.
  6. Definition, calculation and interpretation of the measures of frequency of diseases and mortality.
  7. Need and uses of screening tests.
  8. Accuracy and clinical value of diagnostic and screening test (sensitivity, specificity, predictive values).
  9. Planning, collecting, analyzing and interpreting data with community participation to reach a community diagnosis.
  10. General principles of epidemiology of communicable and non-communicable diseases of public health importance and their control.
  11. Awareness of programmes for control of non-communicable diseases.
  12. a. Planning and investigation of an epidemic of communicable disease in a community setting.  
b. Institution of control measures and evaluation of the effectiveness of these measures.
- Desirable to know
13. The derivation of normal values and the criteria for intervention in case of abnormal values.

## 14. Applications of computers in epidemiology.

### **IX EPIDEMIOLOGY OF SPECIFIC DISEASES COMMUNICABLE & NON-COMMUNICABLE DISEASE**

Must know

The specific objectives of selected communicable and non-communicable diseases of public health importance for which National Disease control/Eradication Programmes have been formulated are described here. For other diseases, the individual teacher would formulate the objectives while drawing the lesson plans. The idea of formulation objectives for a few diseases here is to highlight their importance and emphasize certain learning outcomes.

Communicable Diseases :

Intestinal infection : Poliomyelitis, viral hepatitis, Diarrhoeal disease, Cholera, Helminthiasis including Dracunculiasis.

Respiratory infections : Acute Respiratory infections / Tuberculosis, measles, Diphtheria, Whooping cough.

Vector-borne infections : Malaria, Filariasis, Kala Azar, Dengue.

Surface Infections : Sexually Transmitted Diseases, HIV & AIDS, Tetanus, Leprosy

Zoonosis : Rabies, Japanese encephalitis, Plague, Kyasanur Forest Disease

Non-communicable diseases : Coronary heart diseases Hypertension, Rheumatic heart disease, Cancers, Diabetes, Blindness & accidents.

1. Extent of the problem, epidemiology and natural history of the disease.
2. Relative public health importance of particular disease in a given area.
3. Influence of social, cultural and ecological factors on the epidemiology of the disease.
4. Prevention and control of communicable and non-communicable disease by :
  - a. Diagnosing and treating a case and in doing so demonstrate skills in :
    - i. Clinical methods.
    - ii. Use of essential laboratory techniques.
    - iii. Selection of appropriate treatment regimes.
    - iv. Follow-up of cases.
  - b. Principles of planning, implementing and evaluating prevention and control measures for the disease at the community level bearing in mind the relative importance of the disease.
5. Institution of programmes for the education of individuals and communities.

6. Investigating the disease epidemic and the principles of measures to control the disease epidemic.
7. Awareness of National Disease Control Programmes.

Desirable to know

1. Level of awareness of causation and prevention of disease amongst individuals and communities.
2. Control of communicable and non-communicable diseases by diagnosing and treating a case and in doing so demonstrate skills in :
  - i. Instituting measures, where necessary, for preventing disabilities / deformities.
  - ii. Rehabilitation of the patient.

## X DEMOGRAPHY

Must know

1. Definition of demography and family welfare program.
2. Stages of the demographic cycle and their impact on the population, concept of demographic gap and population explosion.
3. Definition, calculation and interpretation of demographic indices like birth rate, death rate, fertility rates.
4. Reasons for rapid population growth in India and population dynamics.
5. Need for population control measures and the National Population Policy.

## XI. REPRODUCTIVE AND CHILD HEALTH

Must know

1. Need for specialized services for these groups.
2. Magnitude of morbidity and mortality in these groups in the local area and different regions.
3. Local customs and practices during pregnancy, childbirth and lactation and complementary feeding.
4. Concepts of Reproductive child health (RCH) components, including child survival and safe motherhood, Universal Immunization Programme integrated child development and other existing programmes.
5. Handicapped child.
6. Organization, implementation and evaluation of reproductive child health program components.

7. Identify and describe the different family planning methods and their advantages and shortcomings.
8. Demonstrate skills in motivating a couple for selecting an appropriate family planning method.
9. Medical Termination of Pregnancy Act, (MTP).

Desirable to know

1. Organizations, technical and operational aspects of the National Family Welfare Programme and participate in the implementation of the programme.

## **XII SCHOOL HEALTH**

Must know

1. Objectives of the School Health Programme.
2. Activities of the Programmes like :
  - a. Carrying out periodic medical examination of the children and the teachers.
  - b. Immunization of the children in the school.
  - c. Health education.
  - d. Mid-day meals.

Desirable to know

1. Obtaining participation of the teachers in the school health programmes including maintenance of record; refining healthy practices; early detection of abnormalities, national school health programmes.

## **XIII URBAN HEALTH**

Must know

1. Common health problems (Medical, Social Environmental, Economical, Psychological) of urban slum dwellers.
2. Organization of health services for slum dwellers.
3. Organization of health services in urban areas.

## **XIV HEALTH SYSTEM IN INDIA**

## **XV HEALTH PLANNING & MANAGEMENT INCLUDING**

### **DISASTER MANAGEMENT**

1. Awareness regarding important health legislation in India such as Birth and Death registration act, Prevention of Food Adulteration (PFA) act, and MTP act.

2. Awareness regarding important health legislation in India such as Child Labour act, Consumer protection act, Prenatal diagnostics act, Human organ transplant act, etc.

## XVI. INTERNATIONAL HEALTH

## XVII. GERIATRICS

**XVIII. Bio-medical Waste :** Types, potential risks and their safe management.

## SKILLS

### PART - 1 : General Skills.

The student should be able to :

1. Elicit the clinico-social to describe the agent, host an environment factor that determine and influence health.
2. Recognize and assist in management of common health problems of the community.
3. Apply elementary principles of epidemiology in carrying out simple epidemiological studies in the community.
4. Work as a team member in rendering health care.
5. Carry out health education effectively for the community.

### PART - II : Skills in Relation to Specific Topic

#### 1. Communication

The student should be able to communicate effectively with family members at home, patients at clinics or at homes; individuals, family or a group for health education peers at scientific forums.

#### 2. Team activity

Work as a member of the health team; in planning and carrying out field work like school health.

#### 3. Environmental sanitation

Collect water and stool samples for microbiological evaluation.

#### 4. Communicable and non-communicable diseases (including social problems)

- Eliciting clinico-social history and examining the patient for diagnosis and treatment.
- Assessing the severity and/or classifying dehydration in diarrhoea, upper respiratory tract infection, dog-bite, leprosy.
- Adequate and appropriate treatment and follow-up of leprosy, malaria, filariasis, rabies, upper respiratory tract infections, diarrhoea and dehydration.
- Advise on the prevention and prophylaxis of common diseases like vaccine preventable diseases, tetanus, malaria, filariasis, rabies, cholera, typhoid, intestinal parasites.

5. Maternal and Child Health
  - a. Antenatal-examination of the mother; application of the risk approach in antenatal care.
  - b. Postnatal - assessment of the mother and new born, advice on appropriate family planning method; promotion of breast-feeding; advice on weaning.
  - c. Assessment of growth and development of the child - use of the road to health, immunization to the child; identifying high-risk infants.
  - d. Skills in Vaccine management.
6. Statistics
  - a. Simple random sampling technique.
  - b. Apply appropriate (large sample) tests of significance to make a correct inference.
  - c. Sample analysis and presentation of data.
  - d. Calculation of various health indices.
  - e. Calculation of relative and attributable risks.
  - f. Calculation of sensitivity, specificity and predictive values of screening test.
7. Nutrition
  - a. Conducting a diet survey.
  - b. Community survey and clinical diagnosis of nutritional deficiencies : vitamin A deficiency, iodine deficiency, malnutrition.
  - c. Making recommendation regarding diet.
8. Occupational Health
  - a. Inspection of work sites.
  - b. Recommendation in improving work sites.
  - c. Supervision of workers and programmes.
9. Health Management
  - a. Be an effective team leader.
  - b. Guide and train workers.
  - c. Supervision of workers and programmes.
10. Managerial :
  - a. Organize antenatal and under - five clinic.
  - b. To conduct meetings
  - c. Review of records &
  - d. Principles of supervision.

#### **FIELD VISITS :**

##### **Minimum field visits - 5**

Mandatory visits to

1. Primary Health Centre
2. Sub centre
3. Anganwadi
4. Industrial visit
5. Water purification works
6. Clinico-social posting
7. Family Health Advisory program.

## **TEACHING HOURS**

**Integrated Teaching : 20 Hours**

### **THEORY**

#### **PHASE - I (PRE-CLINICAL) :**

#### **I & II TERM**

	Topic	No. of Hours
1.	Introduction to Community Medicine, Evaluation of Community Medicine	02
2.	Villages in India ; Indian cultural heritage; Indian systems of Medicine	12
3.	Environment and sustainable development	12
4.	Social Factors in Health & Disease	12
5.	Introduction to Basic Statistics;	06
6.	Demography and Family Welfare (including Integrated teaching along with Anatomy, Physiology and Obst. & Gynaecology)	04
7.	Field visits to practice field area	03
8.	Demonstration visits to Hospital and Urban health centre	03
	<b>Total</b>	<b>60 Hrs.</b>

#### **PHASE - II**

#### **TERM - III**

1. Concepts in Health and Disease including Medical Sociology
  2. Environment and Health
  3. Occupational Health including Social Security
  4. Genetics and Health
- Total No. of Hours - 20

#### **TERM - IV**

1. Nutrition and Health including Food Hygiene and Legislation's Related.
  2. Principles and Methods in Epidemiology
  3. Principles of Basic and Applied Medical and Health Statistics
  4. Principles, Methods and Practice of Health Education
- Lectures - 40 Hours  
 Practicals - 20 Hours  
 Field Visits - 60 Hours  
 (Comm. Postings)

#### **TERM - V**

Specific Epidemiology : 40 hrs.

- A. Communicable Diseases including Zoonosis.

## B. Non-Communicable Diseases

### PHASE-III:

#### PART-I

1. M.C.H. Demography and Family Welfare.
2. School Health Services
3. National Health Programmes
4. Mental Health Care and Geriatrics
5. Health Planning and Management including Disaster Management
6. Health Information System
7. Health Care in the Community, Rational Drug Management and Voluntary and Non-Governmental organization.
8. International Health

Total No. of Hours : Lect. 60 : P-40, C/S : 60

#### PRACTICAL

#### PRACTICALS/CLINICO-SOCIAL

1. Spotters from nutrition, environmental health and entomology, helminthes and Parasites, Occupational health, Immunization, MCH & FP Devices, etc.
2. Problem solving exercises including epidemiology and biostatistics.
3. Clinico-Social case studies of common communicable diseases, non-communicable conditions and MCH & FP beneficiaries.

#### SCHEME OF EXAMINATION

Internal Assessment : Total marks: 80, (Theory 60 and Practical 20)

#### Theory: 60 Marks

Minimum of three theory examinations are recommended in II and III phases. The 7th term examination preceding the University examination may be similar to the pattern of University examination. Average of any two best marks obtained in the notified internal examination be taken into consideration for calculating internal assessment. Thirty marks are allotted for theory examinations. The other 30 marks are allotted for day to day activities such as Block postings (10 marks), Family care programme (10 marks) and 10 marks for participation in seminars, assignments, projects and other activities. The total marks be reduced to 60 and sent to the University.

#### Practical: 20 Marks

A minimum of two practical tests is to be conducted. Average of the two tests and marks obtained for records shall be reduced to 15 marks. Five marks may be allotted for records. The marks obtained for practical should be sent to the university.

The internal assessment marks both theory and practical obtained by the candidates should be sent to the University at least fifteen days prior to the commencement of theory examination. Note that a student shall secure at least 35% marks of the total marks fixed for internal assessment in a particular subject in order to be eligible to appear in final university examination.

## **UNIVERSITY EXAMINATION**

\*Note : The examination for Community Medicine will be held in Phase III along with Part-I subjects.

### **A. WRITTEN PAPER : 200 MARKS**

There shall be two papers, each carrying 100 marks. Each paper shall be of 3 hours duration. The pattern of questions would be of three types:

- |                                                |            |
|------------------------------------------------|------------|
| Long essay question - each question carrying   | - 10 Marks |
| Short essay question - each question carrying  | - 5 Marks  |
| Short answer question - each question carrying | - 3 Marks  |

Distribution of subjects in Paper I and Paper II, for the University examination is given below:

#### **Paper I : 100 Marks**

Evolution of public health and concepts of health, environment and health, health education, nutrition and dietetics, occupational health, medical sociology and community mental health, biostatistics, basic epidemiology.

#### **Paper II : 100 Marks**

Epidemiology of specific diseases communicable & non-communicable diseases, demography, reproductive and child health, school health, geriatrics, urban health, health system in India, health planning & management including disaster management, international health.

\* The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

### **B. PRACTICAL : 80 MARKS**

The distribution of different components shall be:

- |                                                                                                                                                           |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| • Problem solving exercises<br>(Problems based on Epidemiology, Biostatistics, Demography, Environmental health, Nutrition and Health care of Community). | - 35 marks |
| • Clinico-Social case presentation                                                                                                                        | - 35 marks |
| • Spotters                                                                                                                                                | - 10 marks |

### **C. VIVA VOCE : 40 MARKS**

Consists of oral questions on all aspects of syllabus.

### **RECOMMENDED BOOKS**

#### **THEORY**

##### **Level - I**

1. K. Park, Park's Text Book of Preventive & Social Medicine, 2002, 17th Edition, M/s Banarasidas Bhanot publishers, Jabalpur, Rs. 400/-.
2. B.K. Mahajan & M.Gupta (1995) Text Book of Preventive & Social Medicine 2nd Edition, Jaypee Brothers.
3. Sathya Swaroop, Introduction to Health Statistics. Latest edition - E & S Living Stone Ltd., Edinburgh, London.
4. B. Sridhar Rao - Text Book of Social Medicine, (1996) or Latest print. M/s Sudha Sridhar, A-4, JNMC Quarter, Belgaum.

#### **PRACTICALS**

1. G.K. Rathnaswamy, A hand Book of Medical Entomology, Latest Edition.
2. K. Park, Text Book of Preventive and Social Medicine, 15th Edition, Publication M/s Banarasidas Bhan, Jabalpur.
3. Gopalan et al, Nutritive Value of Indian Food Stuffs - NIN/ICMR, Hyderabad.

##### **Level - II**

1. Suresh Chandra (1997) Essentials of Community Medicine, 1st Edition, New Central Book Agency, 8/1, Chintamani, Daslane, Calcutta.
2. A.P Kulkarni and J.P Baride (1998) Text Book of Community Medicine, I Edition, Vora Medical Publication, Bombay .
3. B.S. Nagaraj, Community Medicine without tears 1984, print or Latest, Mysore Printers & Publishing House, Clock Tower Squar, Mysore .

##### **Level - III**

1. Donald Nunter, 1978 the Disease of Occupations, 6th Edition or Lates, Hodder & Stoughton, London, Sydney, Aukland, Toronto.
2. International Labour Organization, Encyclopadia of Occupational Health & Safety, Volume 1 & 2, 4th Edition, ILO, Geneva, Switzerland.
3. Jallifee, Clinical Nutrition, W.H.O., Geneva

## TEACHING OF MEDICAL ETHICS IN M.B.B.S.

### 1. INTRODUCTION

Medical ethics is a systematic effort to work within the ethos of medicine, which has traditionally been service to sick.

There is now a shift from the traditional individual patient, doctor relationship, and medical care. With the advances in science and technology and the needs of patient their families and the community, there is an increased concern with the health of society. There is a shift to greater accountability to the society. Doctors and health professionals are confronted with many ethical problems. It is, therefore necessary to be prepared to deal with these problems.

In keeping with its goal to improve quality of education. Rajiv Gandhi University of Health Sciences, recommends introduction of medical ethics in the regular teaching of M.B.B.S. course beginning from first year and continuing till the internship.

### 2. OBJECTIVES

The Objectives of teaching medical ethics should be to enable to students develop the ability to:

1. Identify underlying ethical issues and problems in medical practice.
2. Consider the alternatives under the given circumstances, and
3. Make decisions based on acceptable moral concepts and also traditions practices.

### COURSE CONTENTS (SYLLABUS)

#### 1. Introduction to Medical Ethics

What is Ethics

What are values and norms

Relationship between being ethical and human fulfillment

How to form a value system in one's personal and professional life

Heteronomous Ethics and Autonomous Ethics

Freedom and personal Responsibility

#### 2. Definition of Medical Ethics

Difference between medical ethics and bio-ethics

Major Principles of Medical Ethics

Beneficence	=	fraternity
Justice	=	equality
Self determination (autonomy)	=	liberty

### 3. Perspective of Medical Ethics

The Hippocratic oath  
 The Declaration of Helsinki  
 The WHO Declaration of Geneva  
 International code of Medical Ethics (1993)  
 Medical Council of India Code of Ethics (2002)

### 4. Ethics of the Individual

The patient as a person  
 The Right to be respected  
 Truth and Confidentiality  
 The autonomy of decision  
 The concept of disease, health and healing  
 The Right to health  
 Ethics of Behaviour modification  
 The Physician - Patient relationship  
 Organ donation

### 5. The Ethics of Human life

What is human life  
 Criteria for distinguishing the human and the non-human  
 Reasons for respecting human life  
 The beginning of human life  
 The beginning of human life  
 Conception, contraception  
 Abortion  
 Prenatal sex-determination  
 In vitro fertilization (IVF), Artificial Insemination by Husband (AIH)  
 Artificial Insemination by Donor (AID),  
 Surrogate motherhood, Semen Intrafallopian Transfer (SIFT),  
 Gamete Intrafallopian Transfer (GIFT), Zygote Intrafallopian Transfer (ZIFT),  
 Genetic Engineering

### 6. The Family and Society in Medical Ethics

The Ethics of human sexuality  
 Family Planning perspectives  
 Prolongation of life  
 Advanced life directives - The Living Will

## 7. Death and Dying

Use of life-support systems  
Death awareness  
The moment of death  
Prolongation of life  
Ordinary and extraordinary life support  
Advanced life directives  
Euthanasia - passive and active  
Suicide - the ethical outlook  
The right to die with dignity

## 8. Profession Ethics

Code of conduct  
Contract and confidentiality  
Charging of fees, Fee-splitting  
Prescription of drugs  
Over-investigating the patient  
Low - Cost drugs, vitamins and tonics  
Allocation of resources in health care  
Malpractice and Negligence

## 9. Research Ethics

Animal and experimental research / humanness  
Human experimentation  
Human volunteer research - Informed Consent  
Drug trials

## 10. Ethical workshop of cases

Gathering all scientific factors  
Gathering all human factors  
Gathering all value factors  
Identifying areas of value - conflict, Setting of priorities,  
Working our criteria towards decisions

## 4. TEACHING/LEARNING EXPERIENCE

Classroom teaching would focus on professional relationship, patient-doctor relationship, issues at the beginning and end of life, reproductive technologies, resource allocation and health policy. It will also deal with values, ethical concepts and principles.

Clinical ethics must be taught as part of bedside teaching, group discussions, case studies, problem analyzing and problem solving exercises may also be employed.

Demonstrating by example, how to identify and resolve a particular problem.

Increasing the awareness and knowledge of students of the value dimensions of interactions with the patients, colleagues, relations and public.

Fostering the development of skills of analysis, decision making and judgment.

Making the students aware of the need to respect the rights of the patient as also duties and responsibilities of the doctor.

#### Recommended distribution of Teaching hours in different phases of MBBS Course

Total Teaching Hours : 40

Phase I : Preclinical Period - 6 hours

2 hours each by Anatomy, Physiology, Biochemistry during the I year.

Phase II : Paraclinical Period - 6 hours

2 hours each from Pharmacology, Pathology and Microbiology.

Phase III: Community Medicine - 4 hours

2 hours each from Ophthalmology and ENT = 4 hours.

2 hours each in two terms from Medicine, Surgery, and OBG=12 hours

8 hours from other clinical departments.

N.B.: The teaching of Medical Jurisprudence by the department of Forensic Medicine will continue as before.

## 5. EVALUATION

All major subjects should have at least one short answer question on Medical Ethics appropriate for the subject introduced in the University question paper, and a few questions may be asked during the viva voce examination e.g., basic principle in informed consent, confidentiality, etc.

At least one short answer question may be asked on medical ethics appropriate to the subject in all major subjects in the university question paper. A few questions may be asked during viva voce examination.

## 6. RECOMMENDED READING

1. Francis C.M., Medical Ethics, 2nd Edn, 2004, Jaypee Brothers, New Delhi, Rs. 150/-.
2. Ethical Guidelines for Biomedical Research on Human Subjects, Indian Council of Medical Research, New Delhi, 2000.

# **ANNEXURE I**

## **DIFFERENT METHODS RECOMMENDED FOR INTERNAL ASSESSMENT BY MCI**

The Medical Council of India has given some examples of methods for internal assessment of student, which may be followed by the colleges. They are :

1. Credit for preparation and presentation of seminars by students.
2. Preparation of clinical case for presentation.
3. Clinical case study / problem solving exercises.
4. Participation in project for health care in the community
5. Proficiency in conducting a small research project or assignment.
6. Multiple choice questions (MCQ) test after completion of a chapter / system.

Each item shall be objectively assessed and recorded. Some of the items can be assigned as homework/vacation work.

# ANNEXURE II

A comprehensive list of skills recommended as desirable for Bachelor of Medicine and Bachelor of Surgery (MBBS) Graduate: ( by Medical Council of India in Regulations on Graduate Medical Education, 1997)

## I. Clinical evaluation

- a. To be able to take a proper and detailed history.
- b. To perform a complete and thorough physical examination and elicit clinical signs.
- c. To be able to properly use the Stethoscope, Blood pressure apparatus, Otoscope, Thermometer, Nasal speculum etc;
- d. To be able to perform internal examination - per rectum (PR), per vaginum (PV) etc;
- e. To arrive at a proper provisional clinical diagnosis.

## II. Bed side diagnostic tests

- a. To do and interpret haemoglobin (Hb), total count (TC), erythrocyte sedimentation rate (ESR), blood smear for parasites, urine examination / albumin / sugar / ketones / microscopy;
- b. Stool exam for ova and cysts;
- c. To do Gram's stain and Ziehl-Neelsen stain for AFB;
- d. To do skin smear for lepro bacilli;
- e. To do and examine a wet film vaginal smear for Trichomonas;
- f. To do a skin scraping and Potassium hydroxide (KOH) stain for fungal infections;
- g. To perform and read Mantoux test.

## III. Ability to carry out procedures

- a. To conduct CPR (Cardiopulmonary resuscitation) and First aid in newborns, children and adults.
- b. To give subcutaneous (SC) / intramuscular (IM) / Intravenous (IV) injections and start Intravenous (IV) infusions.
- c. To pass a nasogastric tube and give gastric lavage.
- d. To administer oxygen - by mask / catheter.
- e. To administer enema.
- f. To pass a urinary catheter - male and female
- g. To insert flatus tube.
- h. To do pleural tap, ascitic tap and lumbar puncture,
- i. Insert intercostal tube to relieve tension pneumothorax.
- j. To relieve cardiac tamponade.

k. To control external haemorrhage.

#### **IV. Anaesthetic Procedures**

- a. Administer local anaesthesia and nerve block
- b. Be able to secure airway patency, administer oxygen by Ambu bag.

#### **V. Surgical Procedure**

- a. To apply splints, bandages and plaster of Paris (POP) slabs;
- b. To do incision and drainac, of abscesses;
- c. To perform the management and suturing of superficial wounds;
- d. To carry our minor surgical procedures, e.g. excision of small cysts and nodules, circumcision, reduction of paraphimosis, debridement of wounds etc.,
- e. To perform vasectomy,
- f. To manage anal fissures and give injection for piles.

#### **VI. Obstetric Procedures**

- a. To perform thorough antenatal examination and identify high-risk pregnancies.
- b. To conduct normal delivery;
- c. To apply low forceps and perform and suture episiotomies;
- d. To insert and remove IUD's and to perform tubectomy.

#### **VII. Paediatrics**

- a. To assess new born and recognize abnormalities and I.U. retardation;
- b. To perform immunization;
- c. To teach infant feeding to mothers;
- d. To monitor growth by the use of 'road to health chart' and to recognize development retardation;
- e. To assess dehydration and prepare and administer Oral Rehydration Therapy (ORT);
- f. To recognize ARI clinically;

#### **VIII. ENT Procedures**

- a. To be able to remove foreign bodies;
- b. To perform nasal packing for epistaxis;
- c. To perform tracheostomy;

#### **IX. Ophthalmic Procedures**

- a. To invert eyelids;
- b. To give subconjunctival injection;
- c. To perform epilation of eye-lashes;
- d. To measure the refractive error and advise correctional glasses;
- e. To perform nasolacrimal duct syringing for patency.

## **X. Dental Procedures**

- a. To perform dental extraction

## **XI. Community Health**

- a. To be able to supervise and motivate, community and para-professionals for corporate efforts for the health care;
- b. To be able to carry on managerial responsibilities, e.g. Management of stores, indenting, stock keeping and accounting;
- c. Planning and management of health camps;
- d. Implementation of national health programmes;
- e. To effect proper sanitation measures in the community, e.g. disposal of infected garbage, chlorination of drinking water;
- f. To identify and institute control measures for epidemics including its proper data collecting and reporting;

## **XII. Forensic medicine including toxicology**

- a. To be able to carry on proper medico legal examination and documentation of injury and age reports.
- b. To be able to conduct examination for sexual offences and intoxication;
- c. To be able to preserve relevant ancillary materials for medico legal examination;
- d. To be able identify important post-mortem finding in common unnatural deaths.

## **XIII. Management of emergencies**

- a. To manage acute anaphylactic shock;
- b. To manage peripheral vascular failure and shock;
- c. To manage acute pulmonary oedema and LVF;
- d. Emergency management of drowning, poisoning and seizures;
- e. Emergency management of bronchial asthma and status asthmaticus;
- f. Emergency management of hyper pyrexia;
- g. Emergency management of comatose patients regarding airways, positioning prevention of aspiration and injuries;
- h. Assess and administer emergency management of burns.

# ANNEXURE III

## Coordinated Programme in Theory for MBBS Phase-I of One Year Course in Anatomy, Physiology and Biochemistry

### I TERM

Month	Anatomy	Physiology	Biochemistry	Integrated Teaching
1	General Anatomy General Embryology General Histology General Human Genetics	General Physiology Cell membrane, Transport Homeostasis Body fluids Biophysical principles	Cell structure Sub-cellular components Biophysical principles PH, buffers Biochemistry of nucleic acids	
2	Osteology Myology Arthrology	Haematology Muscle physiology	Classification sources & functions of proteins, carbohydrate & lipids	Anatomy Physiology Biochemistry Pathology
3 & 4	Heart, Blood vessels, Lungs, Pleura Systemic embryology	Cardiovascular system Respiratory system	Plasma proteins Protein synthesis Diagnostic enzymology	
5 & 6	Abdomen Digestive and Genitourinary organs with systemic embryology	Digestive system secretion and motility	Digestive enzymes Vitamins, Digestion and absorption of food principles	

## II TERM

Month	Anatomy	Physiology	Biochemistry	Integrated Teaching
	Pelvis	Renal and reproductive Physiology	Liver function, detoxification, renal function, gastric function	
7 & 8	Neuroanatomy Special senses Neural development	Nervous system Special senses Autonomic Nervous system Endocrine glands	Metabolism of carbohydrates, Amino acids, protein, fats, minerals, water.	Endocrine and exocrine pancreas (Diabetes Mellitus) Anatomy + Physiology + Biochemistry
9 & 10	Brain, Cerebral cortex, Ventricular system, Brain coverings, Limbic system	Higher functions Emotion, behaviour	Neurotransmitter, Radio Isotopes, Biological, Oxidation, Electron transfer cycle	CSF Anatomy + Physiology Biochemistry

## Coordinated Programme for Dissection/Practical/Demonstration

## I TERM

Month	Anatomy	Physiology	Biochemistry
1	Upper limb Dissection Prosected part Histology tissues Muscles Bone marrow	Osmotic effect Osmotic hemolysis of RBC, ESR. Principles of hemocytometry	Viscosity, Principles of colourimetry PH- Meter Spectrometry Sp. Gravity of body fluids
2	Lower limb Dissection Prosected part Histology-bone connection Tissue Embryology	Haematology experiments Muscle experiments	Biochemistry test for Carbohydrate Proteins Fats Minerals
3	Thorax Abdomen Embryology model	Spirometry Stethography Artificial respiration FEV, Breath sounds	

## II TERM

Month	Anatomy	Physiology	Biochemistry
5 & 6	Thorax Abdomen Pelvis Embryology model	Arterial pulse Venous pulse Blood Pressure, ECG (Demon) Echocardiography (Demon.) Stress test Heart sounds	Urine examination Liver function test Renal clearance test
7 & 8	Head and Neck	Clinical examination of : <ul style="list-style-type: none"> <li>• Cranial nerves</li> <li>• Sensory function</li> <li>• Motor function</li> </ul>	Glucose Tolerance Test: Blood Glucose estimation Chemistry of food Chemistry of milk
9 & 10	Brain	Examination of higher functions, reflexes.	CSF Analysis

Urine : Physical and Chemical

Estimation of Glucose in blood and urine G. T. T.

# ANNEXURE IV

## Topics for Integrated Teaching Programme during MBBS Phase - I course

### I TERM

Sl.No	Topic	Department to Organise	Department to Participate
1.	Anaemia	Physiology	Physiology, Biochemistry & Pathology
2.	Jaundice	Biochemistry	Physiology, Biochemistry & Pathology
3.	Coronary circulation	Physiology	Anatomy, Physiology & Biochemistry
4.	Malnutrition and Starvation	Biochemistry	Physiology, Biochemistry & Community Medicine
5.	Human genetics	Anatomy	Anatomy, Biochemistry & Physiology

### II TERM

Sl.No	Topic	Department to Organise	Department to Participate
1.	Acid base balance	Biochemistry	Biochemistry & Physiology
2.	Thyroid gland	Anatomy	Anatomy, Physiology & Biochemistry
3.	Pancreas	Anatomy	Anatomy, Physiology & Biochemistry
4.	Stomach	Anatomy	Anatomy, Physiology & Biochemistry
5.	Limbic system, Emotion, learning	Physiology	Anatomy & Physiology
6.	Growth and Development	Physiology	Anatomy & Physiology
7.	Cerebral ventricles, CSF	Anatomy	Anatomy & Physiology

# ANNEXURE ANNEXURE

V

## Segregation of Biomedical Waste and Colour Coding

Sl.No	Segregation categories	Category	Colour codes (Bags/Liners) *
1.	Anatomical parts & lab solid waste	1 & 3	Yellow
2.	Soiled wasted e.g. used dressings	6	Red
3.	All plastics including IV sets	7	Blue
4.	Sharps and needles	4	Puncture Proof Box
5.	Glass Bottles		White

\* Nonchlorinated plastic bags > 20 microns

**SCHEDULE - I**  
**(SEE RULE 5)**  
**CATEGORIES OF BIO-MEDICAL WASTE**

**Waste Category No.	Waste Category **Type	Treatment & Disposal **Options
Category No. 1	<b><u>Human Anatomical Waste</u></b> (human tissues, organs, body parts)	Incineration <sup>o</sup> /deep burial*
Category No. 2	<b><u>Animal Waste</u></b> (animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges, discharge from hospitals, animal houses)	Incineration <sup>o</sup> /deep burial*
Category No. 3	<b><u>Microbiology &amp; biotechnology Waste</u></b> (wastes from laboratory cultures, stocks or specimens of micro-organisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)	Local autoclaving/micro-waving/incineration <sup>o</sup>
Category No. 4	<b><u>Waste sharps</u></b> (needles, syringes, scalpels, blades, glass, etc., that may cause puncture and cuts. This includes both used and unused sharps)	Disinfection (chemical treatment <sup>o</sup> /auto claving/micro-waving and mutilation/shredding <sup>aa</sup> )
Category No. 5	<b><u>Discarded Medicines and Cytotoxic drugs</u></b> (wastes comprising of outdated, contaminated and discarded medicines)	Incineration <sup>o</sup> /destruction and drugs disposal in secured landfills
Category No. 6	<b><u>**Soiled Waste</u></b> (items contaminated with blood and body fluids including cotton, dressings, soiled plaster casts, liners, beddings, other material contaminated with blood)	Incineration <sup>o</sup> autoclaving/micro-waving
Category No. 7	<b><u>Solid Waste</u></b> (wastes generated from disposable items other than the waste **sharps such as tubings, catheters, intravenous sets, etc.)	Disinfection by chemical treatment <sup>o</sup> /autoclaving/micro-waving and mutilation/shredding <sup>aa</sup>
Category No. 8	<b><u>Liquid Waste</u></b> (waste generated from laboratory and washing,) cleaning, housekeeping and disinfecting activities)	Disinfection by chemical treatment <sup>o</sup> and discharge into drains

**Waste Category No.	Waste Category **Type	Treatment & Disposal **Options
Category No. 9	<b>Incineration Ash</b> (ash from incineration of any bio-medical waste)	Disposal in municipal landfill
Category No. 10	<b>Chemical Waste</b> (chemicals used in production of biologicals, chemicals used in disinfection as insecticides etc.,)	Chemical treatment <sup>o</sup> and discharge into drains for liquids and secured landfill for solids

- \*\* As per Bio-Medical Waste (Management & Handling) (Second Amendment) Rules, 2000, dated 2nd June, 2000.
- oo Chemicals treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.
- m Mutilation/shredding must be such so as to prevent unauthorized reuse.
- o There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.
- \* Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.

## COLOUR CODING AND TYPE OF CONTAINER FOR DISPOSAL OF BIO-MEDICAL WASTES

### SCHEDEULE - II

(See Rule 5)

Colour Coding	Type of Container	Waste Category	Treatment Options as per Schedule-I
Yellow	Plastic bag	Cat. 1, Cat. 2, and Cat. 3, Cat. 6.	Incineration/deep burial
Red	Disinfected container/plastic bag	Cat. 3, Cat. 6, Cat. 7.	Autoclaving/Micro-waving chemical Treatment.
Blue/ White Translucent	Plastic bag/ puncture proof container	Cat. 4, Cat. 7.	Auto claving/Micro-waving/ Chemical Treatment and destruction/shredding
Black	Plastic bag	Cat. 5 and Cat. 9 and Cat. 10 (solid)	Disposal in secured landfill

Notes:

1. Colour coding of waste categories with multiple treatment options as defined in Schedule-I shall be selected depending on treatment option chosen, which shall be as specified in Schedule-I.
2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
3. Categories 8 and 10 (liquid) do not require containers / bags.
4. Category 3 if disinfected locally need not be put in containers/bags.

# RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES



## VISION VISION STATEMENT

The Rajiv Gandhi University of Health Sciences, Karnataka, aims at bringing about a confluence of both Eastern and Western Health Sciences to enable the humankind "Live the full span of our lives allotted by God in Perfect Health"

It would strive for achievement of academic excellence by Educating and Training

**Health Professionals who**

- > Shall recognize health needs of community,
- > Carry out professional obligations Ethically and Equitably and in keeping with National Health Policy, It would promote development of scientific temper and Health Sciences Research.

It would encourage inculcation of Social Accountability amongst students, teachers and Institutions.

It would Support Quality Assurance for all its educational programmes.

## MOTTO MOTTO

Right for Rightful Health Sciences Education



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